

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-103584
(43)Date of publication of application : 09.04.2002

(51)Int.Cl.

B41J 2/01
B41J 2/18
B41J 2/185
B41J 11/02

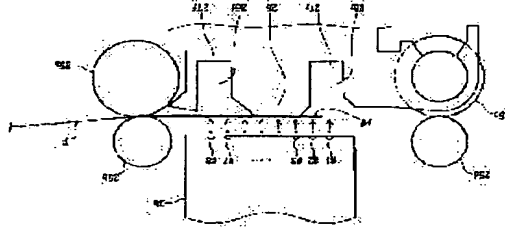
(21)Application number : 2000-294074 (71)Applicant : SEIKO EPSON CORP
(22)Date of filing : 27.09.2000 (72)Inventor : OTSUKI KOICHI

(54) PRINTING UP TO END PART OF PRINT SHEET WITHOUT CONTAMINATING PLATEN

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a technology for printing up to the end part of a print sheet without hitting an ink drop against a platen by means of a dot printer recording dots on the surface of a print medium using a dot recording head provided with a plurality of dot forming elements ejecting ink drops.

SOLUTION: A print sheet P is sub-scan fed to upstream side sheet feed rollers 25a and 25b and when the front end Pf reaches above a downstream side groove part 26r, printing is started by ejecting an ink drop Ip from an print head 28. Since print is started when the front end Pf of the print sheet P is located in the rear of a nozzle #1, an image can be printed up to the end of the print sheet P with no margin at the front end Pf thereof by ejecting an ink drop Ip from each nozzle regardless of whether the nozzle is located above the print sheet or not. At the time of printing in the vicinity of the front end Pf of the print sheet P, printing is performed by repeating micro sub-scan feeding. According to the method, the front end part of the print sheet can be printed above the downstream side groove part 26r.



LEGAL STATUS

[Date of request for examination] 28.10.2003

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 3575415

[Date of registration] 16.07.2004

[Number of appeal against examiner's decision]

Copyright (C): 1998,2003 Japan Patent Office

of rejection]
[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

* NOTICES *

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] It is the dot recording device which records a dot on the surface of print media using the dot recording head in which two or more dot formative elements which carry out the regurgitation of the ink droplet were prepared. The horizontal-scanning mechanical component which drives at least one side of said dot recording head and said print media, and performs horizontal scanning. So that said dot formative element may be faced in the head mechanical component in which drive at least the part of said two or more dot formative elements in the midst of said horizontal scanning, and a dot is made to form, and a part of course [at least] of said horizontal scanning. The platen which is extended and prepared towards said horizontal scanning, and supports said print media so that said dot recording head may be faced. It has the vertical-scanning mechanical component which drives said print media in the intervals of said horizontal scanning in the direction of said horizontal scanning, and the direction at which it crosses, and performs vertical scanning, and a control section for controlling said each part. Said platen in the location which faces the dot formative element located in one [at least] edge of the both ends of the direction of said vertical scanning among said two or more dot formative elements It has the slot extended and prepared towards said horizontal scanning. Said control section (a) [near the edge of said print media], while recording a dot by the 1st recording mode When said print media is supported by said platen and the upper limit or lower limit of said print media is on opening of said slot In the function to carry out edge printing which is made to breathe out an ink droplet from a part of dot formative element [at least] in the location which faces said slot, and forms a dot on said print media, and the interstitial segment of the (b) aforementioned print media. The dot recording device characterized by having the function which records a dot by the 2nd recording mode with the maximum larger vertical-scanning feed per revolution than the maximum vertical-scanning feed per revolution in said 1st recording mode.

[Claim 2] It is the dot recording device which does not make an ink droplet breathe out from dot formative elements other than the dot formative element in the location which faces said slot in case it is a dot recording device according to claim 1 and said control section carries out said edge printing.

[Claim 3] It is the dot recording device equipped with the function to carry out said edge printing when it is a dot recording device according to claim 1, said slot is established in the location which faces the dot formative element located in the edge of the downstream of the direction of said vertical scanning at least among said two or more dot formative elements and said control section has the upper limit of said print media on opening of said slot.

[Claim 4] It is the dot recording device equipped with the function to carry out said edge printing when it is a dot recording device according to claim 1 or 3, said slot is established in the location which faces the dot formative element located in the edge of the upstream of the direction of said vertical scanning at least among said two or more dot formative elements and said control section has the lower limit of said print media on opening of said slot.

[Claim 5] It is a dot recording device equipped with the down-stream vertical-scanning mechanical component which is a dot recording device according to claim 1, is prepared in the downstream of the direction of vertical scanning to said dot recording head, holds said print

media with the upper vertical-scanning mechanical component which said vertical-scanning mechanical component is prepared in the upstream of the direction of vertical scanning to said dot recording head, holds said print media, and drives said print media, and drives said print media.

[Claim 6] Vertical-scanning delivery which is a dot recording device according to claim 1, and is performed by said 1st recording mode is a dot recording device which is vertical-scanning delivery of a 1-dot unit.

[Claim 7] Based on the image data to which it is a dot recording device according to claim 1, and the image which should record said control section to said print media was set to the outside of said print media across the edge where said edge printing is carried out, it is the dot recording device with which a dot is formed.

[Claim 8] The dimension of the part which is a dot recording apparatus according to claim 7, and exceeds the edge where said edge printing of said print media of said image is carried out in said image data is a dot recording apparatus set under to the width of face of said slot.

[Claim 9] In the dot recording device which records a dot on the surface of print media using the dot recording head in which two or more dot formative elements which carry out the regurgitation of the ink droplet were prepared Driving at least one side of said dot recording head and said print media, and performing horizontal scanning Drive at least the part of said two or more dot formative elements, and a dot is formed. It is the dot record approach of driving said print media in the intervals of said horizontal scanning in the direction of said horizontal scanning, and the direction at which it crosses, and performing vertical scanning. Said dot recording device So that said dot formative element may be faced in a part of course [at least] of said horizontal scanning Are extended and prepared towards said horizontal scanning, and said print media is supported so that said dot recording head may be faced. It has the platen which has the slot extended and established in the location which faces the dot formative element located in one [at least] edge of the both ends of the direction of said vertical scanning among said two or more dot formative elements towards said horizontal scanning. [near the edge of the (a) aforementioned print media], while said dot record approach records a dot by the 1st recording mode When said print media is supported by said platen and the upper limit or lower limit of said print media is on opening of said slot In the process which carries out edge printing which is made to breathe out an ink droplet from a part of dot formative element [at least] in the location which faces said slot, and forms a dot on said print media, and the interstitial segment of the (b) aforementioned print media. The dot record approach equipped with the process which records a dot by the 2nd recording mode with the maximum larger vertical-scanning feed per revolution than the maximum vertical-scanning feed per revolution in said 1st recording mode.

[Claim 10] It is the print control unit which generates the data which should be supplied to the dot Records Department which records a dot on the surface of print media using the dot recording head in which two or more dot formative elements which carry out the regurgitation of the ink droplet were prepared. The horizontal-scanning mechanical component which said dot Records Department drives at least one side of said dot recording head and said print media, and performs horizontal scanning. So that said dot formative element may be faced in the head mechanical component in which drive at least the part of said two or more dot formative elements in the midst of said horizontal scanning, and a dot is made to form, and a part of course [at least] of said horizontal scanning. The platen which is extended and prepared towards said horizontal scanning, and supports said print media so that said dot recording head may be faced. It has the vertical-scanning mechanical component which drives said print media in the intervals of said horizontal scanning in the direction of said horizontal scanning, and the direction at which it crosses, and performs vertical scanning, and a control section for controlling said each part. Said platen in the location which faces the dot formative element which said two or more dot formative elements obtain, and is located in one [at least] edge of the both ends of the direction of said vertical scanning It has the slot extended and prepared towards said horizontal scanning. Said print control unit. The print control unit with which the image which should be recorded is equipped with the image data generation section which generates said

image data set up to the outside of said print media across the edge where said edge printing is carried out to said print media.

[Claim 11] To a computer equipped with the dot recording device which records a dot on the surface of print media using the dot recording head in which two or more dot formative elements which carry out the regurgitation of the ink droplet were prepared Driving at least one side of said dot recording head and said print media, and performing horizontal scanning Drive at least the part of said two or more dot formative elements, and a dot is formed. It is the record medium which recorded the computer program for driving said print media in the intervals of said horizontal scanning in the direction of said horizontal scanning, and the direction at which it crosses, and making vertical scanning perform and in which computer reading is possible. Said dot recording device so that said dot formative element may be faced in a part of course [at least] of said horizontal scanning Are extended and prepared towards said horizontal scanning, and said print media is supported so that said dot recording head may be faced. In the location which faces the dot formative element located in one [at least] edge of the both ends of the direction of said vertical scanning among said two or more dot formative elements It has the platen which has the slot extended and prepared towards said horizontal scanning. Said record medium The function in which the image which should be recorded generates said image data set up to the outside of said print media across the edge where said edge printing is carried out to said print media The record medium which is recording the computer program for realizing said computer and in which computer reading is possible.

[Translation done.]

* NOTICES *

JP0 and NCPI are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

- [0001] [Field of the Invention] This invention relates to the technique which prints to the edge of a print sheet about the technique which records a dot on the surface of a record medium using a dot recording head, without soiling a platen especially.
- [0002] [Description of the Prior Art] In recent years, the printer which carries out the regurgitation of the ink from the nozzle of the print head has spread widely as an output unit of a computer. Drawing 30 is the side elevation showing the circumference of the print head of the conventional printer. A print sheet P is supported so that head 28a may be faced on platen 26a. And a print sheet P is sent in the direction of an arrow head A with the upstream paper feed rollers 25p and 25q arranged on the upstream of platen 26a, and the downstream paper feed rollers 25r and 25s arranged on the lower stream of a river of a platen 26. If ink is breathed out from a head, on a print sheet P, one by one, a dot will be recorded and an image will be printed.
- [0003] [Problem(s) to be Solved by the Invention] If it is going to print an image to the edge of a print sheet in the above printers, it is necessary to arrange a print sheet so that the edge of a print sheet may be located on a print head lower part, i.e., a platen, and to make an ink droplet breathe out from the print head. However, in such printing, from the print sheet edge which an ink droplet should carry out this arrival cartridge, it may shift and may reach the target on a platen by the error of delivery of a print sheet, gap of the impact location of an ink droplet, etc. In such a case, the print sheet which passes through a platen top after that will be soiled in the ink which reached the target on the platen.
- [0004] This invention is made in order to solve the above-mentioned technical problem in the conventional technique, and it aims at offering the technique which prints to the edge of a print sheet, without making an ink droplet reach a platen.
- [0005] [The means for solving a technical problem, and its operation and effectiveness] In order to solve a part of above-mentioned technical problem [at least], in this invention, predetermined processing is performed for the dot recording device which records a dot on the surface of print media using the dot recording head in which two or more dot formative elements which carry out the regurgitation of the ink droplet were prepared. This dot recording device is equipped with the platen which is extended and prepared towards horizontal scanning, supports print media so that a dot recording head may be faced, and has the slot extended and established in the location which faces the dot formative element located in one [at least] edge of the both ends of the direction of vertical scanning among two or more dot formative elements towards horizontal scanning so that a dot formative element may be faced in a part of course [at least] of horizontal scanning.
- [0006] It is dot record which drives at least the part of two or more dot formative elements, forms a dot, drives print media in the intervals of horizontal scanning in the direction of horizontal scanning, and the direction at which it crosses, and performs vertical scanning.

printing (record of a dot) carried out in such an airline printer driving at least one side of a dot recording head and print media, and performing horizontal scanning. While recording a dot by the 1st recording mode [near the edge of print media] in that case, when print media is supported by the platen and it is on the upper limit of print media, or opening of the lower limit fang furrow section, an ink droplet is made to breathe out from a part of dot formative element [at least] in the location which faces a slot, and edge printing which forms a dot on print media is carried out. And in the interstitial segment of print media, a dot is recorded by the 2nd recording mode with the maximum larger vertical-scanning feed per revolution than the maximum vertical-scanning feed per revolution in the 1st recording mode.

[0007] It can print without a margin to the edge of a print sheet, without using the dot formative element in the location which faces such a mode, then a slot, and making an ink droplet reach a platen.

- [0008] Moreover, in case edge printing is carried out, it is desirable to make it not make an ink droplet breathe out from dot formative elements other than the dot formative element in the location which faces a slot. In printing of such a mode, then the upper limit of print media, when the feed per revolution of vertical scanning of the print media till then is insufficient and does not reach even on the upper limit fang furrow section (i.e., also when the upper limit of print media will be located on a platen and a part of platen will face a direct dot recording head), a platen is not soiled by the ink droplet. In printing of the lower limit of print media, the feed per revolution of vertical scanning of print media is excessive, and the same is said of the case where it has passed through the lower limit fang furrow section top of print media.
- [0009] When a slot is established in the location of vertical scanning which faces the dot formative element located in the edge of the downstream of the direction of vertical scanning at least among two or more dot formative elements and it is on opening of the upper limit fang furrow section of print media, it is desirable to carry out edge printing. An image is [that there is no margin in such a mode, then the upper limit of print media] recordable.
- [0010] Moreover, when a slot is established in the location which faces the dot formative element located in the edge of the upstream of the direction of vertical scanning at least among two or more dot formative elements and it is on opening of the lower limit fang furrow section of print media, it is desirable to carry out edge printing. An image is [that there is no margin in such a mode, then the lower limit of print media] recordable.
- [0011] In addition, in a mode equipped with the upper vertical-scanning mechanical component which the vertical-scanning mechanical component which carries out vertical scanning in an airline printer is prepared in the upstream of the direction of vertical scanning to said dot recording head, holds said print media, and drives said print media, and the down-stream vertical-scanning mechanical component which is prepared in the downstream of the direction of vertical scanning to said dot recording head, holds said print media, and drives said print media, record of the above dots has the following advantages.
- [0012] In the above airline printers, vertical scanning must be performed only by the upper vertical-scanning mechanical component and one of down-stream vertical-scanning mechanical components in the case of printing of the edge of print media. In such an airline printer, if the above printings are performed, distance which prints by performing vertical scanning only by the upper vertical-scanning mechanical component and one of down-stream vertical-scanning mechanical components can be shortened.
- [0013] In addition, as for vertical-scanning delivery performed by the 1st recording mode, it is desirable that it is vertical-scanning delivery of a 1-dot unit. If it does in this way, in a dot recording head, the edge of print media is recordable with the nozzle near the edge of the direction of vertical scanning.
- [0014] In addition, it is desirable that the image which should be recorded generates the image data set up to the outside of print media across the edge where edge printing is carried out, and forms a dot to print media on the occasion of the above printings based on the image data. If it is made such, also when the locational error of print media exists, based on the image set to the outside of print media, it can print to the print media of the part overflowing from an assumption location.

[0015] Furthermore, as for the dimension of the part exceeding the edge where edge printing of print media of an image is carried out, in image data, it is desirable to be set under to the width of face of a slot. If it is made such, the ink droplet for recording the part set up across the edge where edge printing of print media is carried out can position print media to a dot recording head also about the case where it does not reach the target on print media so that those ink droplets may be made to reach the target in a slot.

[0016] In addition, this invention can be realized in various modes as shown below.

- (1) The dot record approach, the printing control approach, the printing approach.
- (2) A dot recording device, a print control unit, an airline printer.
- (3) The computer program for realizing above-mentioned equipment and an above-mentioned approach.
- (4) The record medium which recorded the computer program for realizing above-mentioned equipment and an above-mentioned approach.
- (5) The data signal embodied in the subcarrier including the computer program for realizing above-mentioned equipment and an above-mentioned approach.

[0017]

[Embodiment of the Invention] Below, the gestalt of operation of this invention is explained in order of the following based on an example.

A. outline [of an operation gestalt] : -- B. 1st example: -- C. 2nd example: -- D. 3rd example: -- mode: which has E. side slot -- F. modification: [0018] A. The outline of an operation gestalt : drawing 1 is the side elevation showing the surrounding structure of the print head of the ink jet printer in the gestalt of operation of this invention. In drawing 1, the print sheet P is held and sent to the upstream paper feed rollers 25a and 25b (vertical-scanning delivery), and the front end Pf passed through the 26f [of upstream slots], and platen 26 top, and has resulted on opening of downstream slot 26r. At this time, an ink droplet lp is breathed out from the print head 28, and printing is started. Since printing is started when the front end Pf of a print sheet P is after nozzle #1, even if there are some paper feed errors, an image can be printed to an edge, without making a margin in the front end section Pf of a print sheet P. The ink droplet which did not reach a print sheet P is absorbed by absorption member 27r.

[0019] It is desirable that a feed per revolution prints by repeating minute vertical-scanning delivery whose number is one in the case of printing near the front end Pf of a print sheet P. By doing so, it becomes easy to print a print sheet front end part on downstream slot 26r.

[0020] Drawing 2 shows the situation of printing in the lower limit Pr of a print sheet P. In drawing 2, in the culmination of printing, the print sheet P is held and sent only to the downstream paper feed rollers 25c and 25d, and the back end Pr has resulted on opening of downstream slot 26r. At this time, an ink droplet is breathed out from the print head 28, and the print sheet back end section is printed. Since it prints when the back end Pr of a print sheet P is before nozzle #8, even if there are some paper feed errors, an image can be printed to an edge, without making a margin in the back end section Pr of a print sheet. The ink droplet which did not reach a print sheet P is absorbed by 27f of absorption members.

[0021] It is desirable to print by repeating minute vertical-scanning delivery also in the case of printing near the back end Pr of a print sheet. By doing so, it becomes easy to print a print sheet back end part on 26f of upstream slots.

[0022] B. The configuration of 1st example:(1) equipment : drawing 3 is the block diagram showing the configuration of the image processing system as an example of this invention, and an airline printer. The scanner 12 and the printer 22 are connected to the computer 90 so that it may illustrate. It functions as an image processing system by loading a predetermined program to this computer 90, and performing, and also it combines with a printer 22 and functions as an airline printer. This computer 90 is equipped with following each part mutually connected by the bus 80 focusing on CPU81 which performs various data processing for controlling the actuation in connection with an image processing according to a program. ROM82 stores beforehand various programs and data required at CPU81 to perform various data processing, and RAM83 is memory by which various programs and data required to perform various data processing by CPU81, similarly are written temporarily. The input interface 84 manages the input of the signal

from a scanner 12 or a keyboard 14, and the output interface 85 manages the output of the data to a printer 22. CRT86 controls the signal output to CRT21 in which color display is possible, and a disk controller (DDC) 87 controls transfer of the data between a hard disk 16, or the flexible drive 15 or the CD-ROM drive which is not illustrated. The various programs with which a hard disk 16 is provided in the form of [which is loaded to RAM83 and performed] various programs or a device driver are memorized.

[0023] In addition, the serial input/output interface (SIO) 88 is connected to the bus 80. It connects with the modem 18 and this SIO88 is connected to the dial-up line PNT through the modem 18. It is also possible by connecting the computer 90 to the external network through this SIO88 and modem 18, and connecting with the specific server SV to download a program required for an image processing to a hard disk 16. Moreover, it is also possible to load a required program by the flexible disk FD and CD-ROM, and to perform a computer 90.

[0024] Drawing 4 is the block diagram showing the configuration of the software of this airline printer. By computer 90, the application program 95 is operating under a predetermined operating system. The video driver 91 and the printer driver 96 are included in the operating system, and image data D for transmitting to a printer 22 will be outputted to it through these drivers from an application program 95. The application program 95 which performs the retouch of an image etc. reads an image from a scanner 12, and it shows the image to CRT21 through a video driver 91, performing predetermined processing to this. The data ORG supplied from a scanner 12 are the original color picture data ORG which are read in a color copy and consist of a color component of (Red R) Green (G) and three colors of blue (B).

[0025] If this application program 95 emits a printing instruction, the printer driver 96 of a computer 90 will change image data into reception from an application program 95, and will have changed this into the signal (signal multiple-value-sized here about each color of cyanogen, a Magenta, light cyanogen, a light Magenta, Hierro, and black) which can process a printer 22. The interior of a printer driver 96 is equipped with the resolution conversion module 97, the color correction module 98, the halftone module 99, and the rasterizer 100 in the example shown in drawing 4. Moreover, the color correction table LUT and the dot formation pattern table DT are memorized. In addition, an application program 95 is equivalent to the "image data generation section" said to a claim.

[0026] The resolution conversion module 97 plays the role changed into the resolution of the color picture data which the application program 95 is treating, i.e., the resolution in which a printer driver 96 can treat the number of pixels per unit length. In this way, the cyanogen (C) which a printer 22 uses for every pixel, the color correction module 98 referring to the color correction table LUT since the image data by which resolution conversion was carried out is image information which still consists of three colors of RGB, a Magenta (M), light cyanogen (LC), a light Magenta (LM), and Hierro -- it changes into the data of each color of (Y) and black (K).

[0027] The data by which color correction was carried out have the gradation value by width of face, such as for example, 256 gradation. By distributing and forming a dot, the halftone module 99 is a printer 22 and performs half toning for expressing this gradation value. The halftone module 99 performs half toning, after setting up the dot formation pattern of each ink dot by referring to the dot formation pattern table DT according to the gradation value of image data. In this way, the processed image data is rearranged in order of the data which should be transmitted to a printer 22 by the rasterizer 100, and is outputted as final print-data PD. Print-data PD contains the data in which the raster data showing the record condition of the dot at the time of each horizontal scanning and a vertical-scanning feed per revolution are shown. In this example, although it is only playing the role which forms an ink dot according to print-data PD and the printer 22 is not performing the image processing, it does not interfere as what performs these processings by the printer 22, of course.

[0028] Next, drawing 5 explains the outline configuration of a printer 22. This printer 22 consists of the device in which Form P is conveyed by the paper feed motor 23, a device in which carriage 31 is made to reciprocate to the shaft orientations of a platen 26 by the carriage motor 24, a device in which drive the print head 28 carried in carriage 31, and formation of the

regurgitation of ink and an ink dot is performed, and a control circuit 40 that manages an exchange of a signal with these paper feed motors 23, the carriage motor 24, the print head 28, and a control panel 32 so that it may illustrate.

[0029] The device in which carriage 31 is made to reciprocate to the shaft orientations of a platen 26 is constructed over the shaft of a platen 26, and parallel, and consists of location detection sensor 39 grades which detect the pulley 38 which stretches the endless driving belt 36 between the sliding shafts 34 and the carriage motors 24 which hold carriage 31 possible [sliding], and the home position of carriage 31.

[0030] Carriage 31 — the cartridge 71 for black ink (K), cyanogen (C), light cyanogen (LC), a Magenta (M), light MAZENDA (LM), and Hierro — the cartridge 72 for color ink which contained the ink of six colors of (Y) can be carried. A total of six heads 61 for ink regurgitation thru/or 66 are formed in the print head 28 of the lower part of carriage 31, and the introductory tubing 67 which leads the ink from an ink tank to each of this head for colors is set up by the pars basilaris oissis occipitalis of carriage 31. If carriage 31 is equipped with the cartridge 71 for black (K) ink, and the cartridge 72 for color ink from the upper part, the introductory tubing 67 will be inserted in the connection hole prepared in each cartridge, and supply of the head 61 for regurgitation thru/or the ink of 66 will be attained from each ink cartridge.

[0031] 48 nozzles Nz are formed in the head 61 of each color prepared in the carriage 31 lower part thru/or 66 for every color, and piezo-electric element PE which is one of the electrostriction components and was excellent in responsibility is arranged for every nozzle.

Piezo-electric element PE is installed in the location adjacent to the ink path to which ink is led to Nozzle Nz. The crystal structures of piezo-electric element PE are distortion and the component which changes electric-mechanical energy into a high speed extremely by impression of an electrical potential difference as everyone knows. Piezo-electric element PE elongates only the impression time amount of an electrical potential difference, and makes one side attachment wall of an ink path deform in this example by impressing the electrical potential difference of predetermined time width of face to inter-electrode [which was prepared in the both ends of piezo-electric element PE]. Consequently, it contracts according to elongation of piezo-electric element PE, and the ink equivalent to a part for this contraction serves as Particle lp, and ink path 68 product is breathed out by the high speed from the tip of Nozzle Nz. Printing is performed when this ink particle lp sinks into the form P with which the platen 26 was equipped.

[0032] Drawing 6 is the explanatory view showing the array of the ink jet nozzle Nz in the heads 61-66 for ink regurgitation. Arrangement of these nozzles consists of 6 sets of nozzle arrays which carry out the regurgitation of the ink for black (K), cyanogen (C), and light (cyanogen LC) (Magenta M) light MAZENDA (LM) (Hierro Y) each color of every, and is arranged by the single tier in the nozzle pitch k with 48 fixed nozzles, respectively. In addition, a "nozzle pitch" is a value which shows a part for what raster (a part for namely, what pixel) spacing of the direction of vertical scanning of the nozzle allotted on the print head is. For example, the pitch k of the nozzle which opens spacing for three rasters in between, and is allotted is 4.

[0033] Drawing 7 is the top view showing the circumference of a platen 26. The platen 26 is formed towards horizontal scanning by this printer 22 for a long time than the maximum width of the usable print sheet P. And the upstream paper feed rollers 25a and 25b are formed in the upstream of a platen 26. They are two or more small rollers which upstream paper feed roller 25b rotates freely to upstream paper feed roller 25a being one driving roller. Moreover, the downstream paper feed rollers 25c and 25d are formed in the lower stream of a river of a platen. Downstream paper feed roller 25c is two or more rollers formed in the driving shaft, and downstream paper feed roller 25d is two or more small rollers which rotate freely. The slot is established in the downstream paper feed roller 25d peripheral face in parallel with the direction of a revolving shaft. That is, downstream paper feed roller 25d, it has the gear tooth (part between slots) in the peripheral face at the radial, and when it sees from a revolving shaft, it is visible to a gearing-like configuration. This downstream paper feed roller 25d, it is called a common name "Giza Laura", and the role which pushes a print sheet P on a platen 26 is played. In addition, downstream paper feed roller 25c and upstream paper feed roller 25a rotate

synchronously so that the speed of a periphery may become equal.

[0034] The print head 28 reciprocates the platen 26 top inserted into these upstream paper feed rollers 25a and 25b and the downstream paper feed rollers 25c and 25d in horizontal scanning. A print sheet P is held at the upstream paper feed rollers 25a and 25b and the downstream paper feed rollers 25c and 25d, and it is supported so that the nozzle train of the print head 28 may be faced by the top face of a platen 26 in a part in the meantime. And an image is recorded one by one in the ink which vertical-scanning delivery is carried out and breathed out from the nozzle of the print head 28 with the upstream paper feed rollers 25a and 25b and the downstream paper feed rollers 25c and 25d. In addition, these upstream paper feed rollers 25a and 25b are the "upstream vertical-scanning mechanical components" said to a claim, and the downstream paper feed rollers 25c and 25d are the "downstream vertical-scanning mechanical components" said to a claim.

[0035] Moreover, 26f of upstream slots and downstream slot 26r are prepared in the upstream and the downstream of the direction of vertical scanning at the platen 26, respectively. 26f of upstream slots and downstream slot 26r are prepared by this printer 22 along the main scanning direction for a long time than the maximum width of the usable print sheet P, respectively. Moreover, the absorption members 27f and 27r for absorbing this in response to an ink droplet lp, respectively are allotted to 26f of these upstream slots, and the pars basilaris oissis occipitalis of downstream slot 26r. And downstream slot 26r is prepared in the location which faces some nozzle groups Nr (nozzle of the part shown with a slash in drawing 7) of the downstream which contains the nozzle of the lowest style among the nozzles Nz on the print head 28. And 26f of upstream slots is established in the location which faces some nozzle groups NF (not shown in drawing 7) of the upstream which contains the nozzle of the maximum upstream among the nozzles on the print head 28. The print sheet P passes through the opening top of 26f of these upstream slots, and downstream slot 26r, while it is having vertical-scanning delivery carried out by the upstream paper feed rollers 25a and 25b and the downstream paper feed rollers 25c and 25d.

[0036] Next, the internal configuration of the control circuit 40 (refer to drawing 5) of a printer 22 is explained. The PC interface 45 which exchanges data with the computer 90 besides CPU41, PROM42, and RAM43, the buffer 44 for a drive which outputs ON of an ink dot and the signal of OFF to the heads 61-66 for ink regurgitation are formed in the interior of a control circuit 40, and these components and circuits are mutually connected by bus. A control circuit 40 stores the dot data processed by computer 90 in reception, stores this in RAM43 temporarily, and outputs it to the buffer 44 for a drive to predetermined timing.

[0037] Conveying Form P by the paper feed motor 23, it makes carriage 31 reciprocate by the carriage motor 24, drives the piezo-electric element of each nozzle unit of the print head 28 to coincidence, performs the regurgitation of each color ink droplet lp, forms an ink dot, and the printer 22 which has the hardware configuration explained above forms a multicolor image on Form P.

[0038] In addition, in the printer of this example, in order to print the upper limit Pf of a print sheet P on downstream slot 26r and to print a lower limit Pr on 26f of upstream slots, different printing processing from the interstitial segment of a print sheet is performed [near the print sheet near the lower limit near the upper limit]. On these specifications, "upper limit processing" and printing processing [processing / processing / in the interstitial segment of a print sheet / printing / "intermediate processing intermediate treatment", a call, and near the upper limit of a print sheet / printing / near the lower limit of a print sheet] are called "lower limit processing." Moreover, when calling upper limit processing and lower limit processing collectively, it is called "vertical edge processing."

[0039] Moreover, the width of face W of the direction of vertical scanning of 26f of upstream slots and downstream slot 26r can be defined by the following formula.

[0040] $W = p \times n + \alpha$ [0041] Here, p is 1 time of the feed per revolution [an inch] of vertical-scanning delivery in vertical edge processing, n is the count of vertical-scanning delivery carried out in upper limit processing and each lower limit processing, alpha is the error of vertical-scanning delivery assumed in upper limit processing and each lower limit processing. As for the

value of alpha in lower limit processing (26f of upstream slots), it is desirable to set up more greatly than the value of alpha in upper limit processing (downstream slot 26r). The slot which has only the width of face which can catch enough the ink droplet breathed out from a nozzle in the case of defining the width of face of the slot of a platen by the above formulas, then vertical edge processing can be prepared.

[0042] (2) Upper limit processing of the vertical-scanning delivery: (i) 1st example : drawing 8 is the explanatory view showing how each raster is recorded by which nozzle [near the upper limit (tip) of a print sheet]. Here, in order to simplify explanation, it explains only using the nozzle train of one train. And the nozzle train of one train shall have eight nozzles. Each nozzle takes charge of record of one raster in the case of horizontal scanning. Here, a "raster" is the train of the pixel on a par with a main scanning direction. And a "pixel" is the grid of the shape of a grid virtually defined on print media, in order to specify the location which an ink droplet is made to reach the target and records a dot. Here, each nozzle shall open spacing for three rasters, and shall be allotted.

[0043] In drawing 8, the grid of one train perpendicularly located in a line expresses the print head 28. The figure of 1-8 in each grid shows the nozzle number. In a specification, "#" is given to these numbers and each nozzle is expressed. Drawing 8 shifts and shows in order the print head 28 sent relatively [direction / of vertical scanning] to the right from the left with time amount. As shown in drawing 8, in upper limit processing, vertical-scanning delivery per dot is repeated 7 times. Besides, edge processing is printing in the "1st recording mode" said to a claim. In addition, the "dot" of the unit of a vertical-scanning feed per revolution means the pitch for 1 dot corresponding to the print resolution of the direction of vertical scanning, and this [its] is equal also to the pitch of a raster.

[0044] Then, it shifts to intermediate processing intermediate treatment, and delivery of 5 dots, 2 dots, 3 dots, and 6 dots is repeated in the order. This intermediate processing intermediate treatment is printing in the "2nd recording mode" said to a claim. Thus, the method which performs vertical scanning combining a different feed per revolution is called "irregular delivery." Operation of the above vertical-scanning delivery records each raster with two nozzles except for a part of rasters, respectively. That is, at this example, each raster is printed with two nozzles. For example, in drawing 8, the 5th raster is recorded with the nozzle of #2, and the nozzle of #1 from a top. Under the present circumstances, the nozzle of #2 records the pixel of an even address and the nozzle of #1 records the pixel of an odd address. Moreover, the 9th raster is recorded with the nozzle of #3, and the nozzle of #2 from a top. Thus, the method which shares the pixel in one raster with two or more nozzles, and prints it is called "overlap printing." One raster has a dot recorded in overlap printing by two or more nozzles which pass through the raster top in horizontal scanning of the multiple times from which the location of the direction of vertical scanning of the print sheet to the print head differs mutually.

[0045] On the other hand, in drawing 8, the nozzle of #1 only passes four rasters once in horizontal scanning in the case of printing from the maximum upper case. Therefore, about these rasters, with two nozzles, can share a pixel and it cannot be printed. Therefore, in this example, it shall not carry out using it, in order that these four rasters may record an image. That is, the raster which can be used in order to record an image in this example is taken as the raster of the 5th henceforth from the edge of the direction upstream of vertical scanning among the rasters on which the nozzle on the print head 28 can record a dot. The field of the raster which can be used in order to record this image is called "the field which can be printed." Moreover, the field of the raster which is not used for image recording is called a "printing improper field." In drawing 8, the number attached sequentially from the top is indicated on the left-hand side of drawing about the raster on which the nozzle on the print head 28 can record a dot. Henceforth, also in the drawing explaining record of the dot of upper limit processing, it is the same. In addition, the nozzle surrounded with the thick frame in drawing is a nozzle which records a dot on a raster.

[0046] Moreover, in drawing 8, three nozzles pass the 13th and the 15th raster in horizontal scanning in the case of printing from a top. About such a raster that three or more nozzles pass in printing, only two nozzles of them shall record a dot. After those rasters shift to intermediate

processing intermediate treatment as much as possible, it is desirable to record with the nozzle which passes through the raster top, since the combination of the nozzle which passes through the raster top which irregular delivery is performed and adjoins each other in intermediate processing intermediate treatment is different -- the law per dot -- it is because it is expectable that a printing result serves as high definition compared with the upper limit processing to which rule delivery is carried out.

[0047] In this example, an image is recorded without a margin to the upper limit of a print sheet. As mentioned above, in this example, the raster (field which can be printed) of the 5th henceforth can be used from the edge of the direction upstream of vertical scanning among the rasters on which the nozzle on the print head 28 can record a dot, and an image can be recorded, therefore, the upper limit of a print sheet -- a starting [arrange a print sheet to the print head 28, and]-record of dot, then theory top can record the until [upper limit full] image of a print sheet so that the 5th raster may be located in a last-minute location from the above-mentioned edge. However, in the case of vertical-scanning delivery, an error may arise about a feed per revolution. Moreover, the discharge direction of an ink droplet may shift according to the manufacture error of the print head etc. Since it is such, also about the case where the impact location of the ink droplet to a print sheet top shifts, it is desirable to make it a margin not arise in the upper limit of a print sheet. Therefore, in this example, among the rasters on which the nozzle on the print head 28 can record a dot, image data D used for printing is set up from the 5th raster, is one side from the edge of the direction upstream of vertical scanning, and decides that the upper limit of a print sheet P starts printing from the condition which is in the location of the 7th raster from the edge of the direction upstream of vertical scanning.

Therefore, the assumption location of the print sheet upper limit to each raster at the time of printing initiation is a location of the 7th raster from the edge of the direction upstream of vertical scanning, as shown in drawing 8.

[0048] Drawing 9 is the top view showing the relation between image data D and a print sheet P. As mentioned above, in this example, image data D is set up to the outside of a print sheet P exceeding the upper limit Pf of a print sheet P. Moreover, also about a lower limit side, since it is the same, image data D is set up to the outside of a print sheet P across the lower limit Pr of a print sheet P. Therefore, in this example, the magnitude of image data D and a print sheet P, and image data D at the time of printing and the relation of arrangement of a print sheet P come to be shown in drawing 9. In this example, the width of face of the part of image data D set up to the outside of a print sheet P exceeding the upper limit Pf of a print sheet P is a part for two rasters. Moreover, the width of face of the part of image data D in which a print sheet P carries out outside ***** across the lower limit Pr of a print sheet P is a part for two rasters similarly. In addition, on these specifications, when use the word of "upper limit (section)" and "a lower limit (section)", making it correspond to the travelling direction of vertical-scanning delivery of the print sheet P on a printer 22, when the image data recorded on a print sheet P makes it correspond up and down and it calls the edge of a print sheet P, and calling the edge of a print sheet P the word of "the front end (section)" and "the back end (section)" is used. On these specifications, in a print sheet P, "upper limit (section)" corresponds to "the front end (section)", and "a lower limit (section)" corresponds to "the back end (section)".

[0049] Drawing 10 is the side elevation showing the print head 28 at the time of printing initiation, and the relation of a print sheet P. Here, a platen 26 is counted from the nozzle of the 28 print head#2, by two rasters, from the back location, shall be counted from the nozzle of #7 and shall be prepared in the range R26 to the location of 2 raster quota. Therefore, even when an ink droplet is made to breathe out from each nozzle in the condition that there is no print sheet, the ink droplet from the nozzle of #1, #2, #7, and #8 does not reach a platen 26.

[0050] In drawing 7, the nozzle group Nr of the part shown with the slash of the print head 28 is the part in which the nozzle of #1 and #2 is located. Printing is started when the upper limit Pf of a print sheet P is in the location which downstream slot 26r is prepared and is shown under the part short dash line on downstream slot 26r.

[0051] As mentioned above, the upper limit Pf of a print sheet P is in the location of the 7th

raster from the edge of the direction upstream of vertical scanning among the rasters on which the nozzle on the print head 28 can record a dot at the time of printing initiation. That is, if it explains using drawing 10, the upper limit of a print sheet P will be counted from the nozzle of #1, and will be in a back location by six rasters. In addition, in drawing 10, the broken line shows the location of the raster assumed on image data. Although the raster (it sets to drawing 8 and is the 5th raster from a top) of the maximum upper case of the field which can be printed should be recorded with the nozzle of #2 if it is that carry out and backlash starts printing from this condition, there is still no print sheet P in the nozzle lower part of #2. Therefore, if the print sheet P is correctly sent with the upstream paper feed rollers 25a and 25b, the ink droplet 1p breathed out from the nozzle of #2 will fall to downstream slot 28r as it is. Moreover, the nozzle of #1 is also to record the raster of the maximum upper case of this field that can be printed after 4 times of 1-dot delivery, as shown in drawing 8. However, in the phase where 4 times of 1-dot delivery was carried out, there is still no print sheet P in the nozzle lower part of #1 similarly. Therefore, the ink droplet 1p then breathed out from the nozzle of #1 will also fall to downstream slot 28r as it is. The same thing can say also about the case where the 2nd raster (it sets to drawing 8 and is the 6th raster from a top) is recorded from on the field which can be printed.

[0052] However, when more print sheets P than an original feed per revolution have been sent for a certain reason, the upper limit of a print sheet P may come to the location of the 2nd raster and the raster of the maximum upper case of the field which can be printed from on the field which can be printed. In this example, since the nozzle of #1 and #2 is breathing out the ink droplet 1p to those rasters such even case, an image can be recorded on the upper limit of a print sheet P, and a margin is not made. That is, even when more print sheets P than an original feed per revolution have been sent, as an alternate long and short dash line shows drawing 10, when the excessive feed per revolution is the following by two rasters, a margin is not made to the upper limit of a print sheet P.

[0053] On the contrary, it is also considered by a certain reason that a print sheet P will be sent fewer than an original feed per revolution. In such a case, there will be no print sheet in the location which should have a print sheet essentially, and an ink droplet 1p will reach the downward structure. However, two rasters are to be recorded with the nozzle of #1 and #2 from the assumption upper limit location of a form in this example, as shown in drawing 8. Even if downstream slot 28r is prepared under these nozzles and an ink droplet 1p does not reach a print sheet P, the ink droplet 1p will fall to downstream slot 28r, and will be absorbed by absorption member 27r. Therefore, an ink droplet 1p reaches the platen 26 top-face section, and does not soil a print sheet behind. That is, in this example, when the upper limit Pf of a print sheet P is more back than an assumption upper limit location at the time of printing initiation and the amount of gaps from an assumption upper limit location is two or less rasters, an ink droplet 1p reaches the platen 26 top-face section, and does not soil a print sheet P behind.

[0054] A print sheet P is held with 2 sets of rollers, the upstream paper feed rollers 25a and 25b and the downstream paper feed rollers 25c and 25d, and it is desirable to carry out vertical-scanning delivery. It is because it is held and vertical-scanning delivery can be more correctly carried out compared with the case where vertical-scanning delivery is carried out, only with one roller. However, in case the upper limit Pf of a print sheet is printed, a print sheet P is held only with the upstream paper feed rollers 25a and 25b, and vertical-scanning delivery is carried out. In this example, printing is started in the condition that the upper limit Pf of a print sheet is located in the location of the 7th raster from the edge of the direction upstream of vertical scanning among the rasters on which the nozzle on the print head 28 can record a dot (refer to drawing 8 and drawing 10). Therefore, from the location, as shown in drawing 10, until the print sheet upper limit Pf is held at the downstream paper feed rollers 25c and 25d, namely, while a print sheet is sent only for the distance of L31, only with the upstream paper feed rollers 25a and 25b, vertical-scanning delivery is carried out and printing is performed. In this example, vertical-scanning delivery is carried out only with these upstream paper feed rollers 25a and 25b, and since the section when printing is performed is comparatively short, a printing result serves as high definition. In addition, the mode which prints near the upper limit Pf of a print sheet with

the nozzle near the edge of the downstream of not only the above modes but the direction of vertical scanning, then the above-mentioned effectiveness can be done so. And it is effective when the delivery precision of an upper vertical-scanning mechanical component (upstream paper feed rollers 25a and 25b) is comparatively low especially.

[0055] Furthermore, in case an upper limit part is printed, the print sheet P is supported by two places of the top face of the upstream paper feed rollers 25a and 25b and a platen 26. For this reason, the upper limit part of a print sheet P cannot bend comparatively easily caudad on downstream slot 28r. Therefore, possibility that the quality of the printing result of an upper limit part will deteriorate by bending of a print sheet is small.

[0056] (i) -- upper limit delivery [of the example of a comparison] --: drawing 11 is the side elevation showing the print head 28 at the time of the printing initiation in the example of a comparison, and the relation of a print sheet P. As shown in drawing 11, even if it prints the upper limit part of a print sheet P in 28r of upstream slots, the ink droplet which did not reach the target on the print sheet P does not reach the top face of a platen 26. However, the distance L32 (refer to drawing 11) to which a print sheet is sent in this example of a comparison after starting printing of the upper limit part of a print sheet before print sheet upper limit is held at the downstream paper feed rollers 25c and 25d is long compared with the case (L31 of drawing 8) of an example. That is, the section when vertical-scanning delivery is carried out at and printing is performed only with the upstream paper feed rollers 25a and 25b is comparatively long. For this reason, the quality of a printing result is low compared with an example.

[0057] Moreover, in case an upper limit part is printed, the print sheet P is held only with the upstream paper feed rollers 25a and 25b. For this reason, the upper limit part of a print sheet P tends to bend caudad on 28r of upstream slots. Therefore, possibility that the quality of a printing result will deteriorate in the case of printing of an upper limit part is comparatively large.

[0058] Lower-limit processing of the 1st example: (iii) Drawing 12 is the explanatory view showing how each raster is recorded by which nozzle in lower limit processing. In drawing 12 R 2, from the place where the n+1st vertical-scanning delivery was performed to the place which carries out the last vertical-scanning delivery [n+17th] is shown. At this example, as shown in drawing 12, after repeating delivery of 5 dots, 2 dots, 3 dots, and 6 dots in the order by vertical-scanning delivery to the n+8th time in intermediate processing intermediate treatment, in lower limit processing, vertical-scanning delivery per dot. Consequently, each raster along a main scanning direction is recorded with two nozzles except for some things, respectively. In addition, in drawing 12, the number attached sequentially from the bottom is indicated on the right-hand side of drawing about the raster on which the nozzle on the print head 28 can record a dot. Henceforth, in the drawing explaining record of the dot of lower limit processing, it is the same. [0059] In drawing 12, the nozzle of #8 only passes four rasters once in printing from the bottom. And from the bottom, 5 or more Motome's raster is recorded with two or more nozzles, and it deals in it. Therefore, the field in the lower limit part of a print sheet which can be printed is a field of 5 or more Motome's raster from the bottom.

[0060] Moreover, in drawing 12, three or more nozzles pass the 9th, the 10th raster, etc. in horizontal scanning in the case of printing from the bottom. About such a raster that three or more nozzles pass in printing, it is desirable to record with the nozzle which passes through the raster top in intermediate processing intermediate treatment as much as possible. It is because it is expectable that a printing result serves as high definition compared with the lower limit processing to which Sadanori delivery per dot is carried out.

[0061] In this example, an image is recorded like the case of upper limit that there is no margin also about a lower limit. As mentioned above, in this example, the nozzle on the print head 28 can use the 5th more than raster (field which can be printed) among the rasters which can record a dot from the edge of the direction lower stream of a river of vertical scanning, and can record an image. However, in consideration of the case where an error arises etc., it shall record on a print sheet from the 7th raster about a feed per revolution from the edge of the direction lower stream of a river of vertical scanning in the case of vertical-scanning delivery. That is, in the condition of being in the location of the 7th raster from the edge of the direction upstream

of vertical scanning, the lower limit of a print sheet performs the regurgitation of an ink droplet Ip also about the 5th and the 6th raster, and performs horizontal scanning of the last in the case of printing. Therefore, the assumption location of the print sheet lower limit to each raster at the time of printing termination is a location of the 7th raster from the edge of the direction lower stream of a river of vertical scanning, as shown in drawing 12.

[0062] Drawing 13 is the top view showing 26f of upstream slots at the time of printing the lower limit section Pr of a print sheet P, and the relation of a print sheet P. In drawing 13, the nozzle group Nf of the part shown with the slash of the print head 28 is the part in which the nozzle of #7 and #8 is located. Printing is ended when the lower limit Pr of a print sheet P is located in the location which 26f of upstream slots is prepared and is shown under the part which those nozzles pass in the case of horizontal scanning with the alternate long and short dash line on 26f of upstream slots.

[0063] Drawing 14 is the side elevation showing the print head 28 at the time of printing the lower limit section Pr of a print sheet P, and the relation of a print sheet P. As mentioned above, in case the lower limit section Pr of a print sheet P is printed, the lower limit Pr of a print sheet P has a nozzle on the print head 28 in the location of the 7th raster among the rasters which can record a dot from the edge of the direction lower stream of a river of vertical scanning (R> drawing 12 2 reference). That is, the lower limit of a print sheet P will be counted from the nozzle of #8, and will be located in the location of 6 raster quota. When it is that carry out and backlash records the 2nd raster (it sets to drawing 12 and they are the 6th and the 5th raster from the bottom) in this condition from the bottom and the bottom of the field which can be printed, the ink droplet Ip breathed out from the nozzle of #7 and #8 will fall to 26f of upstream slots as it is.

[0064] Moreover, since the nozzle of #7 and #8 is breathing out the ink droplet Ip to the raster (it sets to drawing 12 and they are the 5th and the 6th raster from the bottom) set up across the lower limit Pr of a print sheet P also when the print sheet P has been sent for a certain reason fewer than an original feed per revolution, an image can be recorded on the lower limit Pr of a print sheet P, and a margin is not made. That is, as an alternate long and short dash line shows drawing 14, when the insufficient feed per revolution is the following by two rasters, a margin is not made in the lower limit of a print sheet P.

[0065] And two upper rasters (it sets to drawing 12 and they are the 7th and the 8th raster from the bottom) are to be recorded with the nozzle of #7 and #8 from the assumption upper limit location of a form. Therefore, also when more print sheets P than an original feed per revolution have been sent for a certain reason, the breathed-out ink droplet Ip falls to 26f of upstream slots, and does not reach the platen 26 top-face section.

[0066] Moreover, in this example, the raster of the last on a print sheet is recorded in the condition that the lower limit Pr of a print sheet is located in the location (namely, setting to drawing 1414 nozzle # location of 2 raster quota of 7) of the 7th raster among the rasters on which the nozzle on the print head 28 can record a dot from the edge of the direction lower stream of a river of vertical scanning, and printing is ended (refer to drawing 12). Therefore, after the lower limit Pr of a print sheet P leaves the upstream paper feed rollers 25a and 25b, while a print sheet P is sent only for the distance of L41 to the location shown in drawing 14, only with the downstream paper feed rollers 25c and 25d, vertical-scanning delivery is carried out and printing is performed. In this example, vertical-scanning delivery is carried out only with these downstream paper feed rollers 25c and 25d, and since the section when printing is performed is comparatively short, a printing result serves as high definition. Especially downstream paper feed roller 25d is a gearing-like roller, and downstream paper feed rollers [25c and 25d] combination has a low delivery precision compared with the upstream paper feed rollers 25a and 25b. For this reason, it is very effective in upgrading of a printing result that the section when vertical-scanning delivery is carried out at and printing is performed only with the downstream paper feed rollers 25c and 25d is comparatively short. In addition, the mode which prints near the lower limit Pr of a print sheet with the nozzle near the edge of the upstream of not only the above modes but the direction of vertical scanning, then the above-mentioned effectiveness can be done so, and especially — the delivery precision of a down-stream

vertical-scanning mechanical component (downstream paper feed rollers 25c and 25d) — comparatively — delivery — it is effective when low.

[0067] Furthermore, in case a lower limit part is printed, the print sheet P is supported by two places of the top face of the downstream paper feed rollers 25c and 25d and a platen 26. For this reason, the lower limit part of a print sheet P cannot bend comparatively easily caudad on 26f of upstream slots. Therefore, possibility that the quality of the printing result of an upper limit part will deteriorate by bending of a print sheet is small.

[0068] (iv) — lower limit delivery [of the example of a comparison]: — drawing 15 is the side elevation showing the print head 28 at the time of printing the lower limit Pr of the print sheet P in the example of a comparison, and the relation of a print sheet P. As shown in drawing 15, even if it prints the lower limit part of a print sheet P in downstream slot 26r, the ink droplet which did not reach the target on the print sheet P does not reach the top face of a platen 26. However, the distance L42 to which a print sheet is sent after a print sheet lower limit leaves the upstream paper feed rollers 25a and 25b in the example of a comparison before printing is completed, as shown in drawing 15 is long compared with the case (L41 of drawing 14) of an example. That is, the section when vertical-scanning delivery is carried out at and printing is performed only with the downstream paper feed rollers 25c and 25d with a comparatively low delivery precision is long. For this reason, the quality of a printing result is low compared with an example.

[0069] Moreover, in case a lower limit part is printed, the print sheet P is held only with the downstream paper feed rollers 25c and 25d. For this reason, the lower limit part of a print sheet P tends to bend caudad on downstream slot 26r. Therefore, possibility that the quality of a printing result will deteriorate in the case of printing of a lower limit part is comparatively large. [0070] C. The 2nd example: drawing 16 is the side elevation showing the relation between print head 28a in the 2nd example, upstream slot 26fa, and downstream slot 26ra. Here, the case where the nozzle train of one train performs upper limit processing and lower limit processing in the airline printer which has 11 nozzles is explained. In the airline printer used here, downstream slot 26ra is prepared in the location which faces nozzle #1-#3 about the direction of vertical scanning. Moreover, upstream slot 26fa is prepared in the location which faces nozzle #9-#11. Other points are the same configurations as the already explained airline printer. Moreover, overlap printing is not performed in this 2nd example. That is, each raster is recorded with one nozzle in one horizontal scanning.

[0071] (1) Upper limit processing of the 2nd example: drawing 17 and drawing 18 are the explanatory views showing how each raster is recorded by which nozzle in upper limit processing of the 2nd example. Drawing 17 and drawing 18 divide into two upper and lower sides signs that the head records the raster, and are shown. The lower part of drawing 1717 is connected with the upper part of drawing 18. In addition, in drawing 17 and drawing 1818, the rasters from the 38th to [from a top] the 42nd overlap, and are indicated.

[0072] As shown in drawing 17, in upper limit processing of the 2nd example, vertical-scanning delivery of every 3 dots is repeated 11 times. Besides, edge processing is printing in the "1st recording mode" said to a claim. Besides in edge processing, any nozzles other than the nozzle of #1-#3 of print head 28a are not used. In addition, the nozzle surrounded with the thick frame in drawing is a nozzle which records a dot on a raster.

[0073] Then, "shift processing" is performed before performing intermediate processing intermediate treatment rather than performing intermediate processing intermediate treatment immediately. In this shift processing, vertical-scanning delivery of every 3 dots is performed 4 times as well as the time of upper limit processing. All the nozzles of #1-#11 are used in shift processing, then, it is shown in drawing 18 — as — intermediate processing intermediate treatment — shifting — the law of 11 dots — rule delivery is repeated. This intermediate processing intermediate treatment is printing in the "2nd recording mode" said to a claim. [0074] In drawing 17, a nozzle does not pass the 2nd, the 3rd, and the 6th raster in horizontal scanning in the case of printing from the maximum upper case. Therefore, about the raster from the maximum upper case to the 6th, a pixel cannot be printed succeeding an adjacent raster. In this example, these six rasters are "printing improper fields." Moreover, about the raster which

two or more nozzles like the 13th or the 16th raster pass from a top, only the nozzle which finally passes a raster shall record a dot.

[0075] In the 2nd example, the raster (field which can be printed) of the 7th henceforth can be used from the edge of the direction upstream of vertical scanning among the rasters on which the nozzle on print head 28a can record a dot, and an image can be recorded. Therefore, image data D used for printing is set up from the edge of the direction upstream of vertical scanning to the 7th raster. However, since it is the same as that of the 1st example, printing is started from the time of being in the location of the 23rd raster, when the upper limit of a print sheet P is in the 7th location from the edge of the direction upstream of vertical scanning. That is, the assumption location of the upper limit of a print sheet P to each raster at the time of printing initiation is a location of the 23rd raster from the edge of the direction upstream of vertical scanning, as shown in drawing 17. Therefore, in the 2nd example, image data D is prepared by 16 rasters across the location of the upper limit of the print sheet P assumed. For this reason, if that error is less than by 16 rasters even if an error will arise in delivery of a print sheet P and a print sheet P will be sent to it too much, an image can be formed without a margin to the upper limit of a print sheet P.

[0076] Moreover, in the 2nd example, 16 rasters set up across the location of the upper limit of the print sheet P assumed and 20 rasters from the location of upper limit are recorded only by nozzle #1-#3. And downstream slot 26ra is prepared under nozzle #1-#3. Therefore, even if it breathes out an ink droplet to 16 above-mentioned rasters which surpassed the assumption location of the upper limit of a print sheet P, and were set up (in namely, range in which a print sheet does not exist), an ink droplet is not made to reach the target on platen 26a. Moreover, if the error of delivery is less than by 20 rasters, an ink droplet will not be made to reach the target on platen 26a, even if it breathes out an ink droplet to the raster assigned to the upper limit section of a print sheet P, where the error arose in delivery of a print sheet P and a print sheet P is not sent to it to an assumption location.

[0077] (2) Lower limit processing of the 2nd example : drawing 19 and drawing 20 are the explanatory views showing how each raster is recorded by which nozzle in lower limit processing of the 2nd example. In drawing 19, vertical-scanning delivery of the n+1st henceforth is shown. Drawing 19 and drawing 20 divide into two upper and lower sides signs that the head records the raster, and are shown. The lower part of drawing 19 is connected with the upper part of drawing 20. In addition, in drawing 19 and drawing 20, the rasters from the 45th to [from the bottom] the 40th overlap, and are indicated.

[0078] This example shows to drawing 19 and drawing 20 -- as -- intermediate processing intermediate treatment -- setting -- vertical-scanning delivery from the n+1st time to the n-3rd time -- the law of 11 dots -- after repeating rule delivery, in shift processing, delivery of 3 dots is repeated 4 times. And in lower limit processing, delivery of 3 dots is performed after that only using nozzle #9-#11.

[0079] In addition, in the 2nd example, as shown in drawing 20, the nozzle on the print head 28 can record an image from the bottom among the rasters which can record a dot more than using the 7th raster (field which can be printed). However, in the 2nd example, an image is recorded from the bottom more than using the 8th raster. That is, the 8th more than raster is a printing field from under drawing 20, and image data is set up to those rasters.

[0080] Moreover, in drawing 20, two or more nozzles pass the 13th and the 16th rasters in horizontal scanning in the case of printing from the bottom. About such a raster that two or more nozzles pass in printing, the nozzle which passes through the raster top first records a dot.

[0081] In the 2nd example, the nozzle on print head 28a can use the 8th more than raster among the rasters which can record a dot from the edge of the direction lower stream of a river of vertical scanning, and can record an image. Therefore, image data D used for printing is set up to this 8th raster. However, since it is the same as that of the 1st example, printing is ended but [not when the lower limit of a print sheet P is located in the 8th location from the edge of the direction lower stream of a river of vertical scanning] when it is in the location of the 38th raster. That is, the assumption location of the lower limit of the print sheet P to each raster at

the time of printing termination is a location of the 38th raster from the edge of the direction lower stream of a river of vertical scanning, as shown in drawing 20. Therefore, in the 2nd example, image data D is prepared by 30 rasters across the location of the lower limit of the print sheet P assumed. For this reason, if that error is less than by 30 rasters even if an error arises in delivery of a print sheet P and a print sheet P is not sent to it to an assumption location, an image can be formed without a margin to a lower limit.

[0082] Moreover, in the 2nd example, 20 rasters of the upstream are recorded only by nozzle #9-#11 from the location of 30 rasters set up across the location of the lower limit of the print sheet P assumed, and a lower limit. And upstream slot 26fa is prepared under nozzle #9-#11. Therefore, even if it breathes out an ink droplet to the raster which surpassed the assumption location of the lower limit of a print sheet P, and was set up (in namely, range in which a print sheet does not exist), an ink droplet is not made to reach the target on platen 26a. Moreover, if the error of delivery is less than by 20 rasters, an ink droplet will not be made to reach the target on platen 26a, even if it breathes out an ink droplet to the raster assigned to the lower limit section of a print sheet P in the condition that the error arose in delivery of a print sheet P, and the print sheet P has been sent to it too much.

[0083] In addition, when recording the lower limit side of a print sheet P, compared with the time of recording the upper limit side of a print sheet P, a long distance is sent in the print sheet P. Therefore, in case the lower limit side of a print sheet P is recorded, compared with the time of recording the upper limit side of a print sheet P, possibility that the error of the location of a print sheet P is large is high. Moreover, downstream paper feed roller 25d is a gearing-like roller, compared with the upstream paper feed rollers 25a and 25b. Therefore, the possibility that the error at the time of recording a lower limit side is larger is higher than the error of the location of the print sheet P at the time of recording an upper limit side also from this point. Therefore, it is desirable to set up more number of the rasters recorded in the lower limit section of a print sheet P by only the nozzle on upstream slot 26fa (#9-#11) than the number of the rasters recorded in the upper limit section of a print sheet P by only the nozzle on downstream slot 26ra (#1-#3) like the 2nd example. And in image data D, it is more desirable than the number of the rasters which surpass the upper limit of a print sheet P and set up the number of the rasters which surpass and set up the lower limit of a print sheet P to set up mostly.

[0084] D. The 3rd example : drawing 21 is the side elevation showing the relation between print head 28b in the 3rd example, upstream slot 26fb, and downstream slot 26rb. Here, the case where the nozzle train of one train performs upper limit processing and lower limit processing in the airline printer which has 48 nozzles is explained. In the airline printer used here, downstream slot 26rb is prepared in the location which faces nozzle #1-#12 about the direction of vertical scanning. Moreover, upstream slot 26fb is prepared in the location which faces nozzle #37-#48. Other points are the same configurations as the already explained airline printer.

[0085] Drawing 22 is the explanatory view showing the array of the ink jet nozzle Nz in the heads 61b-66b for ink regurgitation in the 3rd example. In this 3rd example, the pitch of each nozzle and the pitch of a raster are the same. Therefore, print head 28b can record a dot on the raster which adjoins each other by horizontal scanning once. In drawing 22, Rr shows the range which faces downstream slot 26rb on platen 26b, and Rf shows the range which faces upstream slot 26fb. The nozzle which exists in Range Rr is nozzle #1-#12, and the nozzle which exists in Range Rf is #37-#48. In the 3rd example, overlap printing is performed using this print head 28b.

[0086] (1) Upper limit processing of the 3rd example : drawing 23 and drawing 24 are the explanatory views showing how each raster is recorded by which nozzle in upper limit processing of the 3rd example. The lower part of drawing 23 is connected with the upper part of drawing 24. In addition, the rasters from the 66th to [from a top] the 74th overlap, and are indicated. [0087] As shown in drawing 23, in upper limit processing of the 3rd example, vertical-scanning delivery of every 6 dots is repeated 10 times. Besides, edge processing is printing in the "1st recording mode" said to a claim. Besides in edge processing, any nozzles other than the nozzle of #1-#12 of print head 28b are not used. The nozzle surrounded with the thick frame in drawing 24 is a nozzle which records a dot on a raster. The nozzle used by upper limit processing is a nozzle

shown as a nozzle group N1 in drawing 22.

[0088] Then, "shift processing" is performed. In this shift processing, vertical-scanning delivery of 6 dots is performed twice as well as the time of upper limit processing. In shift processing, a dot is recorded with #1 - #12 nozzle as well as the case of upper limit processing after the first delivery. And #1 - #30 nozzle is used after the 2nd delivery. Then, it is shown in drawing 2424 -- as -- intermediate processing intermediate treatment -- shifting -- the law of 24 dots -- rule delivery is repeated. All the nozzles of #1-#48 are used in intermediate processing intermediate treatment. This intermediate processing intermediate treatment is printing in the "2nd recording mode" said to a claim. In addition, the nozzle used after the 2nd delivery of shift processing is a nozzle shown as a nozzle group N2 in drawing 22. And the nozzle used in intermediate processing intermediate treatment is a nozzle shown as a nozzle group N3 in drawing 22.

[0089] In drawing 23, about the raster from the maximum upper case to the 6th, since a nozzle passes only once in horizontal scanning in the case of printing, overlap printing cannot be performed. In this example, these six rasters are "printing improper fields." Moreover, about the raster which two or more nozzles like the raster of the 13th henceforth pass from a top, only the nozzle which finally passes a raster, and the nozzle which passes a raster just before that shall record a dot.

[0090] In the 3rd example, image data D used for printing is set up from the edge of the direction upstream of vertical scanning which is the upper limit of the field which can be printed to the 7th raster. However, since it is the same as that of the 1st example, printing is started from the time of the upper limit of a print sheet P being in the location of the 37th raster from the edge of the direction upstream of vertical scanning. The location is shown as an assumption location of the upper limit of a print sheet P in drawing 23. That is, in the 3rd example, image data D is prepared by 36 rasters across the location of the upper limit of the print sheet P assumed. For this reason, if that error is less than by 36 rasters even if an error will arise in delivery of a print sheet P and a print sheet P will be sent to it too much, an image can be formed without a margin to the upper limit of a print sheet P.

[0091] Moreover, in the 3rd example, 36 rasters set up across the location of the upper limit of the print sheet P assumed and 42 rasters from the location of upper limit are recorded only by nozzle #1-#12 on downstream slot 26rb. Therefore, even if it breathes out an ink droplet to 36 above-mentioned rasters which surpassed the assumption location of the upper limit of a print sheet P, and were set up (in namely, range in which a print sheet does not exist), an ink droplet is not made to reach the target on platen 26a. Moreover, if the error of delivery is less than by 42 rasters, an ink droplet will not be made to reach the target on platen 26b, even if it breathes out an ink droplet to the raster assigned to the upper limit section of a print sheet P, where the error arose in delivery of a print sheet P and a print sheet P is not sent to it to an assumption location.

[0092] (2) Lower limit processing of the 3rd example : drawing 25 and drawing 26 are the explanatory views showing how each raster is recorded by which nozzle in lower limit processing of the 3rd example. The lower part of drawing 25 is connected with the upper part of drawing 26.

[0093] this example shows to drawing 25 -- as -- intermediate processing intermediate treatment -- setting -- the law of 24 dots -- after repeating rule delivery, in shift processing, delivery of 6 dots is performed once. The nozzle used after the delivery is #19-#48. Then, in lower limit processing, delivery of 6 dots is performed only using nozzle #37-#48. In addition, the nozzle used after delivery of shift processing is a nozzle shown as a nozzle group N4 in drawing 22. And the nozzle used by lower limit processing is a nozzle shown as a nozzle group N5 in drawing 22.

[0094] In addition, in the 3rd example, as shown in drawing 26, the nozzle on the print head 28 can record an image from the bottom among the rasters which can record a dot more than using the 7th raster (field which can be printed). However, in the 3rd example, an image is recorded from the bottom more than using the 9th raster. That is, the 9th more than raster is a printing field from under drawing 26, and image data is set up to those rasters.

[0095] Moreover, in drawing 26, two or more nozzles pass the 13th more than raster in

horizontal scanning in the case of printing from the bottom. About such a raster that two or more nozzles pass in printing, the nozzle which passes through the raster top first, and the nozzle which passes the raster to the degree record a dot.

[0096] In the 3rd example, image data D used for printing is set up from this the bottom to the 9th raster. However, since it is the same as that of the 1st example, printing is ended but [not when the lower limit of a print sheet P is located in the 9th location from the edge of the direction lower stream of a river of vertical scanning] when it is in the location of the 49th raster. The assumption location of the lower limit of the print sheet P to each raster at the time of printing termination is shown in drawing 26. Therefore, in the 3rd example, image data D is prepared by 40 rasters across the location of the lower limit of the print sheet P assumed. For this reason, if that error is less than by 40 rasters even if an error arises in delivery of a print sheet P and a print sheet P is not sent to it to an assumption location, an image can be formed without a margin to a lower limit.

[0097] Moreover, in the 3rd example, 36 rasters of the upstream are recorded only by nozzle #37-#48 on upstream slot 26fb from the location of 40 rasters set up across the location of the lower limit of the print sheet P assumed, and a lower limit. Therefore, even if it breathes out an ink droplet to the raster which surpassed the assumption location of the lower limit of a print sheet P, and was set up (in namely, range in which a print sheet does not exist), an ink droplet is not made to reach the target on platen 26b. Moreover, if the error of delivery is less than by 36 rasters, an ink droplet will not be made to reach the target on platen 26a, even if it breathes out an ink droplet to the raster assigned to the lower limit section of a print sheet P in the condition that the error arose in delivery of a print sheet P, and the print sheet P has been sent to it too much.

[0098] In addition, also in the 3rd example, more number of the rasters recorded in the lower limit section of a print sheet P by only the nozzle on upstream slot 26fb (#37-#48) than the number of the rasters recorded in the upper limit section of a print sheet P by only the nozzle on downstream slot 26rb (#1-#12) is set up. And in image data D, it has set up more mostly than the number of the rasters which surpass the upper limit of a print sheet P and set up the number of the rasters which surpass and set up the lower limit of a print sheet P.

[0099] E. the voice which prints based on image data D (refer to drawing 9) set as a platen 26 across the vertical edge of a print sheet P in the mode above which has a side slot in the printer 22 which has 26f of upstream slots, and downstream slot 26r as shown in drawing 7 R> 7 -- it attached like and explained. Here, in printer 22n which has left-hand side slot 26na and right-hand side slot 26nb in a platen in addition to 26f of upstream slots, and downstream slot 26r, the mode which prints is explained based on the image data Dn set up across the vertical edge and right-and-left edge of a print sheet P.

[0100] Drawing 27 is the top view showing the relation between image data Dn and a print sheet P. In drawing 27, image data Dn is set up to the outside of a print sheet P not only across the upper limit Pf and lower limit Pr of a print sheet P but across the left-hand side edge Pa and the right-hand side edge Pb. Consequently, in this example, the relation between the assumption location of the magnitude of image data Dn and a print sheet P and the image data Dn at the time of printing and arrangement of a print sheet P comes to be shown in drawing 27. The width of face (width of face of an extended partition) of an image recordable [with this image data Dn] has the width of face which has the width of face exceeding the edge of right and left of a print sheet P, and does not exceed spacing of the side attachment walls of the outside of left-hand side slot 26na and right-hand side slot 26nb. In addition, about the name of right and left of the left-hand side edge Pa and the right-hand side edge Pb, since it is made to correspond with the name of right and left of a printer 22, in the print sheet P, actual right and left and the name of the left-hand side edge Pa and the right-hand side edge Pb are reverse.

[0101] Drawing 28 is the top view showing the printer 22n circumference [platen 26n]. This printer 22n, it has the guides 29a and 29b guided so that a print sheet P may maintain the position of a main scanning direction in the case of vertical scanning of a print sheet P. Moreover, 26f of upstream slots and downstream slot 26r are prepared in platen 26n like the platen 26 of drawing 7. Furthermore, left-hand side slot 26na prolonged in the direction of

vertical scanning so that each both ends with 26f of upstream slots and downstream slot 26r may be connected, and right-hand side slot 26nb are prepared in platen 26n. Left-hand side slot 26na and right-hand side slot 26nb are prepared in the range of the direction of vertical scanning for a long time than the impact range of the ink droplet from the nozzle train on the print head. And left-hand side slot 26na and right-hand side slot 26nb are prepared so that spacing (main scanning direction) of each center lines may become equal to the width of face of the main scanning direction of a print sheet P. Other configurations are the same as that of the above-mentioned printer 22.

[0102] In addition, when a print sheet P is in the predetermined horizontal-scanning location guided with Guides 29a and 29b, left-hand side slot 26na and right-hand side slot 26nb should just be prepared so that one side edge section Pa of the direction of horizontal scanning of a print sheet P may be located on opening of left-hand side slot 26na and the side edge section Pb of another side may be located on opening of right-hand side slot 26nb. Therefore, as mentioned above, when a print sheet P is in an orientation, left-hand side slot 26na and right-hand side slot 26nb may be prepared so that the side edge section of a print sheet P may be located in the inside [center line] and the outside of left-hand side slot 26na and right-hand side slot 26nb in addition to the mode which has the side edge section on the center line of left-hand side slot 26na and right-hand side slot 26nb.

[0103] It connects mutually and 26f of these upstream slots, downstream slot 26r, left-hand side slot 26na, and right-hand side slot 26nb constitute the slot of a quadrilateral. And the absorption member 27 for absorbing this in response to an ink droplet is allotted to the pars basilaris omiss occipitalis.

[0104] The print sheet P passes through the opening top of 26f of upstream slots, and downstream slot 26r, while it is having vertical-scanning delivery carried out by the upstream paper feed rollers 25a and 25b and the downstream paper feed rollers 25c and 25d. Moreover, the print sheet P is positioned about the main scanning direction with Guides 29a and 29b so that the right-hand side edge Pb may be located on right-hand side slot 26nb on platen 26n by locating the left-hand side edge Pa on left-hand side slot 26na. Therefore, in the case of vertical-scanning delivery, the location which has the both-sides edge of a print sheet P on opening of left-hand side slot 26na and right-hand side slot 26nb, respectively is maintained, and delivery is made at it.

[0105] Also in the mode of drawing 28, delivery of the above-mentioned 1st thru/or the 3rd above-mentioned example can be performed according to relative-position relation (each nozzle of a nozzle train, and platen 26n) about sending of vertical scanning of upper limit processing and lower limit processing. Therefore, below, printing of the side edge sections Pa and Pb of a print sheet P is explained.

[0106] Drawing 29 is the explanatory view showing printing of the right-and-left side edge section of a print sheet P. Including upper limit processing and lower limit processing, through the whole record of the image to a print sheet P, in the mode of drawing 28, it prints so that a margin may not be prepared in the right-and-left edge of a print sheet P, either. In that case, in horizontal scanning, the print head 28 is sent till the place where all nozzles are located in the outside of a print sheet P across the edge of a print sheet P, and is sent about one edge till the place where all nozzles are too located in the outside of a print sheet P also about an other end exceeding the other end of a print sheet P. And not only when Nozzle Nz is on a print sheet P, but when it is the location where Nozzle Nz exceeded the edge of a print sheet P and is on left-hand side slot 26na or right-hand side slot 26nb, according to image data Dn, the regurgitation of the ink droplet is carried out from the nozzle Nz. In addition, the image field (extended partition) of image data Dn has the width of face which has the width of face exceeding the edge of right and left of a print sheet P, and does not exceed spacing of the side attachment walls of the outside of left-hand side slot 26na and right-hand side slot 26nb. For this reason, also when a nozzle is on the outside of a print sheet P on left-hand side slot 26na or right-hand side slot 26nb, the regurgitation of the ink droplet can be carried out according to image data Dn.

[0107] By performing such printing, also when a print sheet P shifts to a main scanning direction somewhat, an image can be formed, without making a margin to the both ends of right and left of

a print sheet P. And since the nozzle which prints the both-sides edge of a print sheet is a nozzle located on left-hand side slot 26na or right-hand side slot 26nb, also when an ink droplet shifts from a print sheet P, an ink droplet reaches left-hand side slot 26na or right-hand side slot 26nb, without reaching center-section 26c of a platen 26. Therefore, a print sheet P is not soiled by the ink droplet which reached center-section 26c of a platen 26.

[0108] F. modification: -- the range which this invention is not restricted to an above-mentioned example or an above-mentioned operation gestalt, and does not deviate from that summary in addition -- setting -- various voice -- it is possible to set like and to carry out, for example, the following deformation is also possible.

[0109] F1. modification 1: -- the 1st example -- upper limit processing and lower limit processing -- the law per dot -- rule delivery -- carrying out -- the 2nd example -- every the 3-dot 3rd example -- the law of delivery of every 6 dots -- rule delivery was performed.

However, delivery of upper limit processing and lower limit processing is not restricted to this, and can also be made into Sadanori delivery of 2 dots, 4 dots, and 5 dots according to the number of nozzles and nozzle pitch in a nozzle train. That is, as long as the maximum vertical-scanning feed per revolution is smaller than the maximum vertical-scanning feed per revolution in intermediate processing intermediate treatment, you may be what kind of delivery. However, the upper limit of a print sheet is more recordable with the nozzle of the downstream of the direction of vertical scanning, so that the feed per revolution of vertical-scanning delivery of upper limit processing is small. Therefore, a downstream slot can be narrowed more and the large platen top face supporting a print sheet can be taken. Similarly, the upper limit of a print sheet is more recordable with the nozzle of the upstream, so that the feed per revolution of vertical-scanning delivery of lower limit processing is small. Therefore, an upstream slot can be narrowed more and the large platen top face supporting a print sheet can be taken.

[0110] moreover, irregular delivery to which delivery in intermediate processing intermediate treatment also repeats delivery of 5 dots, 2 dots, 3 dots, and 6 dots in the order and the law of 11 dots -- rule delivery and the law of 24 dots -- it is not restricted to rule delivery. For example, in the configuration shown in the 1st example, it is good also as 5 dots, 3 dots, 2 dots, and 6-dot delivery. moreover, the number of nozzles, a nozzle pitch, etc. -- responding -- the combination of other feeds per revolution -- being also employable -- the law of other feeds per revolution -- it is good also as carrying out rule delivery. That is, as long as the maximum vertical-scanning feed per revolution is larger than the maximum vertical-scanning feed per revolution in upper limit processing or lower limit edge processing, what kind of vertical-scanning delivery may be performed.

[0111] F2. modification 2: In the above-mentioned example, in the 1st example, the upper limit and lower limit side was a part for two rasters, in the 2nd example, upper limit sides were 16 rasters and the lower limit sides of the image set up across the edge of a print sheet were 30 rasters. And in the 3rd example, upper limit sides were 30 rasters and lower limit sides were 40 rasters. However, the magnitude of the image set up across the edge of a print sheet is not restricted to this. For example, width of face of the part of image data D in which a print sheet P carries out outside ***** exceeding the upper limit Pf of a print sheet P can be considered as an equivalent for 1/[of the width of face of downstream slot 26r] 2. Similarly, width of face of the part of image data D in which a print sheet P carries out outside ***** across the lower limit Pr of a print sheet P can be considered as an equivalent for 1/[of the width of face of 26f of upstream slots] 2. Namely, the width of face of the part of the image data set up to the outside of a print sheet across the edge of a print sheet should be [that what is necessary is just smaller about an upper limit side than the width of face of downstream slot 26r] just smaller than the width of face of 26f of upstream slots about a lower limit side. If it is made such, also when there will be nothing in the location which the edge of a print sheet P assumed, the ink droplet for recording the image set up over the print sheet P does not reach platen 26 top face. However, the comparable amount of gaps is permissible also about the case where it shifts to the downstream also about the case where 1/2 of the width of face of a slot, then a print sheet P shift to the upstream.

[0112] Similarly, the width of face of the part of the image data set up to the outside of a print

sheet across the edge of a print sheet also about a side edge on either side should be just smaller than the width of face of ** also about left-hand side slot 26na or right-hand side slot 26nb. And the comparable amount of gaps is permissible also about the case where it shifts to the downstream also about the case where 1/2 of the width of face of a slot, then a print sheet P shift to the upstream.

[0113] F3, modification 3: In the above-mentioned example, although both upper limit processing and lower limit processing were performed, the need is accepted and it may be made to perform only a gap or one side. Moreover, although the airline printer of this example equipped the upstream and the downstream of the direction of vertical scanning of a platen 26 with 26f of upstream slots, and downstream slot 26r, respectively, it is good also as a thing equipped only with either.

[0114] F4, modification 4: You may make it transpose a part of configuration of that hardware was realized to software, and may make it transpose a part of configuration of that software realized to hardware conversely in the above-mentioned example. For example, a host computer 90 can perform a part of function of CPU41 (drawing 5).

[0115] The computer program which realizes such a function is offered with the gestalt recorded on the record medium which a floppy disk, CD-ROM, etc. can computer read. A host computer 90 reads a computer program in the record medium, and transmits it to internal storage or external storage. Or you may make it supply a computer program to a host computer 90 from a program feeder through a communication path. When realizing the function of a computer program, the computer program stored in internal storage is performed by the microprocessor of a host computer 90. Moreover, a host computer 90 may be made to carry out immediate execution of the computer program recorded on the record medium.

[0116] In this specification, in the host computer 90, it is a concept containing hardware and operation system, and the hardware which operates under control of operation system is meant. A computer program makes such a host computer 90 realize the function of above-mentioned each part. In addition, a part of above-mentioned function may be realized by not an application program but operation system.

[0117] In addition, in this invention, not only the record medium of a flexible disk or a pocket mold like CD-ROM but the internal storage in computers, such as various kinds of RAM and ROM, and the external storage currently fixed to computers, such as a hard disk, are included with "the record medium in which computer reading is possible."

[Translation done.]

* NOTICES *

JP0 and NCIP1 are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

- [Drawing 1] The side elevation showing the surrounding structure of the print head of the ink jet printer in the gestalt of operation of this invention.
- [Drawing 2] It is the explanatory view showing the situation of printing in the lower limit Pr of a print sheet P.
- [Drawing 3] The block diagram showing the configuration of the image processing system as an example of this invention, and an airline printer.
- [Drawing 4] The block diagram showing the configuration of the software of this airline printer.
- [Drawing 5] Drawing showing the configuration of the machine part of this airline printer.
- [Drawing 6] The top view showing the example of the array of the nozzle unit for every color in the print head unit 60.
- [Drawing 7] The top view showing the circumference of a platen 26.
- [Drawing 8] The explanatory view showing how each raster is recorded by which nozzle [near the upper limit (tip) of a print sheet].
- [Drawing 9] The top view showing the relation between image data D and a print sheet P.
- [Drawing 10] The side elevation showing the print head 28 at the time of printing initiation, and the relation of a print sheet P.
- [Drawing 11] The side elevation showing the print head 28 at the time of the printing initiation in the example of a comparison, and the relation of a print sheet P.
- [Drawing 12] The explanatory view showing how each raster is recorded by which nozzle in lower limit processing.
- [Drawing 13] The top view showing 26f of upstream slots at the time of printing the lower limit section Pr of a print sheet P, and the relation of a print sheet P.
- [Drawing 14] The side elevation showing the print head 28 at the time of printing the lowest edge of a print sheet, and the relation of a print sheet P.
- [Drawing 15] The side elevation showing the print head 28 at the time of printing the lowest edge of the print sheet in the example of a comparison, and the relation of a print sheet P.
- [Drawing 16] The side elevation showing the relation between print head 28a in the 2nd example, upstream slot 26fa, and downstream slot 26a.
- [Drawing 17] The explanatory view showing how each raster is recorded by which nozzle in upper limit processing of the 2nd example.
- [Drawing 18] The explanatory view showing how each raster is recorded by which nozzle in upper limit processing of the 2nd example.
- [Drawing 19] The explanatory view showing how each raster is recorded by which nozzle in lower limit processing of the 2nd example.
- [Drawing 20] The explanatory view showing how each raster is recorded by which nozzle in lower limit processing of the 2nd example.
- [Drawing 21] The side elevation showing the relation between print head 28b in the 3rd example, upstream slot 26fb, and downstream slot 26b.
- [Drawing 22] The explanatory view showing the array of the ink jet nozzle Nz in the heads 61b-66b for ink regurgitation in the 3rd example.

- [Drawing 23] The explanatory view showing how each raster is recorded by which nozzle in upper limit processing of the 3rd example.
- [Drawing 24] The explanatory view showing how each raster is recorded by which nozzle in upper limit processing of the 3rd example.
- [Drawing 25] The explanatory view showing how each raster is recorded by which nozzle in lower limit processing of the 3rd example.
- [Drawing 26] The explanatory view showing how each raster is recorded by which nozzle in lower limit processing of the 3rd example.
- [Drawing 27] The top view showing the relation between image data Dn and a print sheet P.
- [Drawing 28] The top view showing the printer 22n circumference [platen 26n].
- [Drawing 29] The explanatory view showing printing of the right-and-left side edge section of a print sheet P.
- [Drawing 30] The side elevation showing the circumference of the print head of the conventional printer.
- [Description of Notations]
- | | |
|------------------------|---------------------------------|
| 12 | -- Scanner |
| 14 | -- Keyboard |
| 15 | -- Flexible drive |
| 16 | -- Hard disk |
| 18 | -- Modem |
| 21 | -- CRT |
| 22 or 22n | -- Printer |
| 23 | -- Paper feed motor |
| 24 | -- Carriage motor |
| 25a, 25b | -- Upstream paper feed roller |
| 25c, 25d | -- Downstream paper feed roller |
| 25p, 25q | -- Upstream paper feed roller |
| 25r, 25s | -- Downstream paper feed roller |
| 26, 26a, 26b, 26n, 26o | -- Platen |
| 26c | -- Center section |
| 26f, 26fa, 26fb | -- Upstream slot |
| 26na(s) | -- Left-hand side slot |
| 26nb(s) | -- Right-hand side slot |
| 26r, 26ra, 26rb | -- Downstream slot |
| 27, 27f, 27r | -- Absorption member |
| 28, 28a, 28b, 28o | -- Print head |
| 29a, 29b | -- Guide |
| 31 | -- Carriage |
| 32 | -- Control panel |
| 34 | -- Sliding shaft |
| 36 | -- Driving belt |
| 38 | -- Pulley |
| 39 | -- Location detection sensor |
| 40 | -- Control circuit |
| 41 | -- CPU |
| 42 | -- PROM |
| 43 | -- RAM |
| 44 | -- Buffer for a drive |
| 45 | -- PC interface |
| 60 | -- Print head unit |
| 61-66 | -- Head for ink regurgitation |
| 61b-66b | -- Head for ink regurgitation |
| 67 | -- Introductory tubing |
| 68 | -- Ink path |

71 -- Cartridge
72 -- Cartridge for color ink
80 -- Bus
81 -- CPU
82 -- ROM
83 -- RAM
84 -- Input interface
85 -- Output interface
86 -- CRTc
88 -- SIO
90 -- Host computer
91 -- Video driver
95 -- Application program
96 -- Printer driver
97 -- Resolution conversion module
98 -- Color correction module
99 -- Halftone module
100 -- Rasterizer
D, Dn -- Image data
DT -- Dot formation pattern table
FD -- Flexible disk
Ip -- Ink droplet
L31 -- Distance which vertical-scanning delivery is carried out and is printed only with an upstream paper feed roller
L41 -- Distance which vertical-scanning delivery is carried out and is printed only with a downstream paper feed roller
L32 -- Distance which vertical-scanning delivery is carried out and is printed only with an upstream paper feed roller
L42 -- Distance which vertical-scanning delivery is carried out and is printed only with a downstream paper feed roller
LUT -- Color correction table
N1 -- Nozzle group used by upper limit processing
N2 -- Nozzle group used by shift processing
N3 -- Nozzle group used by intermediate processing intermediate treatment
N4 -- Nozzle group used by shift processing
N5 -- Nozzle group used by lower limit processing
Nf -- Nozzle group of the upstream
Nr -- Nozzle group of the downstream
Nz -- Ink jet nozzle
ORG -- The Hara color picture data
P -- Print sheet
PD -- Print data
PE -- Piezo-electric element
PNT -- Dial-up line
Pa -- Left-hand side edge (section)
Pb -- Right-hand side edge (section)
Pf -- Upper limit (section)
Pr -- Lower limit (section)
R26 -- Range in which the center section of the platen is established
Rf -- Range in which the upstream slot is established
Rr -- Range in which the downstream slot is established
SV -- Server
k -- Nozzle pitch

[Translation done.]

3

テンを備えており、

前記ドット記録方法は、(a) 前記印刷媒体の端部近傍において、第1の記録モードでドットの記録を行うとともに、前記印刷媒体が前記プラテンに支持され、かつ、前記印刷媒体の上端または下端が前記端部の開口上にあるときに、前記端部と向かい合う位置にあるドット形成要素の少なくとも一部からインク滴を吐出させて、前記印刷媒体上にドットを形成する。端部印刷を実施する工

程と、(b) 前記印刷媒体の中間部分において、最大の副走送送り量が前記第1の記録モードにおける最大の副走送送り量より大きい第2の記録モードでドットの記録を行う工程と、を備えるドット記録方法。

【請求項10】 インク滴を吐出する複数のドット形成要素が設けられたドット記録ヘッドを用いて印刷媒体の表面にドットの記録を行うドット記録部において、最大の副走送送り量より大きい第2の記録モードでドットの形成を行わせる

ドット記録部と、前記ドット記録部は、前記ドット記録ヘッドと前記印刷媒体の少なくとも一方を駆動して主走査を行う副走査駆動部と、前記主走査の最中に前記複数のドット形成要素のうちの少なくとも一部を駆動してドットの形成を行わせるヘッ

ド駆動部と、前記主走査の行路の少なくとも一部において前記ドット形成要素と向かい合うように、前記主走査の方向に延長して設けられ、前記印刷媒体を前記ドット記録ヘッドと向かい合うように支持するプラテンと、前記主走査の合間に前記印刷媒体を前記主走査の方向と交わる方向に駆動して副走査を行う副走査駆動部と、前記プラテンを駆動するための制御部と、を備え、前記制御部は、

前記複数のドット形成要素のうち前記副走査の方向の両端のうちの少なくとも一方の端に位置するドット形成要素と向かい合う位置に、前記主走査の方向に延長して設けられる端部を有しており、

前記印刷制御装置は、前記印刷媒体に対して、記録すべき画像が、前記端部印刷が実施される端部を超えて前記印刷媒体の外側まで設定された前記画像データを生成する画像データ生成部を備え、印刷制御装置、

【請求項11】 インク滴を吐出する複数のドット形成要素が設けられたドット記録ヘッドを用いて印刷媒体の表面にドットの記録を行うドット記録装置を備えるコンピュータに、前記ドット記録ヘッドと前記印刷媒体の少なくとも一方を駆動して主走査を行い、前記複数のドット形成要素のうちの少なくとも一部を駆動してドットの形成を行い、前記主走査の合間に前記印刷媒体を前記主走査の方向と交わる方向に駆動して副走査を行わせるためのコンピュータプログラムを記録したコンピュータ読み取り可能な記録媒体であって、

前記ドット記録装置は、

4

前記主走査の行路の少なくとも一部において前記ドット形成要素と向かい合うように、前記主走査の方向に延長して設けられ、前記印刷媒体を前記ドット記録ヘッドと向かい合うように支持し、前記複数のドット形成要素のうち前記副走査の方向の両端のうちの少なくとも一方の端に位置するドット形成要素と向かい合う位置に、前記主走査の方向に延長して設けられる端部を有している、プラテンを備えており、

前記記録装置は、前記印刷媒体に対して、記録すべき画像が、前記端部印刷が実施される端部を超えて前記印刷媒体の外側まで設定された前記画像データを生成する機能を、前記コンピュータに実現させるためのコンピュータプログラムを記録しているコンピュータ読み取り可能な記録媒体。

【発明の詳細な説明】
【0001】

【発明の属する技術分野】この発明は、ドット記録ヘッドを用いて記録媒体の表面にドットの記録を行う技術に関し、特に、プラテンを有することなく印刷紙の端部まで印刷を行う技術に関する。

【0002】

【従来の技術】近年、コンピュータの出力装置として、印刷ヘッドのノズルからインクを吐出するプリンタが普及している。図30は、従来のプリンタの印刷ヘッドの周辺を示す側面図である。印刷用紙Pは、プラテン260上でヘッド280に向かい合うように支持される。そして、印刷用紙Pは、プラテン260の上流に配られた上流副紙送りローラ25p、25q、およびプラテン266の下流に配された下流副紙送りローラ25r、25sによって、矢印Aの方向に送られる。ヘッドからインクが吐出されると、印刷用紙P上に順次、ドットが記録されて、画像が印刷される。

【0003】

【発明が解決しようとする課題】上記のようなプリンタにおいて印刷用紙の端まで画像を印刷しようとするとき、印刷用紙の端が印刷ヘッド下で、すなわちプラテン上に位置するように印刷用紙を配し、印刷ヘッドからインク滴を吐出させる必要がある。しかし、そのような印刷においては、印刷用紙の送りの遅延やインク滴の着弾位置のずれなどによって、インク滴が本来着弾すべき印刷用紙の端部からはずれてプラテン上に着弾してしまう場合がある。そのような場合には、プラテン上に着弾したインクによって、その後にプラテン上を通過する印刷用紙が、汚されてしまう。

【0004】この発明は、従来技術における上述の問題を解決するためになされたものであり、プラテンにインク滴を着弾させることなく印刷用紙の端部まで印刷を行う技術を提供することを目的とする。

【0005】

【課題を解決するための手段およびその作用・効果】上

6

【0010】また、端部を、複数のドット形成要素のうち少なくとも副走査の方向の上流側の端に位置するドット形成要素と向かい合う位置に設けた場合には、印刷媒体の下端が端部の開口上にあるときに、端部印刷を実施することが好ましい。このような態様とすれば、印刷媒体の下端に余白なく画像を記録することができる。

【0011】なお、印刷装置において副走査を実施する副走査駆動部が、前記ドット記録ヘッドに対し副走査方向の上流側に設けられ、前記印刷媒体を保持して前記印刷媒体を駆動する上流副走査駆動部と、前記ドット記録ヘッドに対して副走査方向の下流側に設けられ、前記印刷媒体を保持して前記印刷媒体を駆動する下流副走査駆動部と、を備える態様においては、上記のようなドットの記録は次のような利点を有する。

【0012】上記のような印刷装置においては、印刷媒体の端部の印刷の際には、上流副走査駆動部と下流副走査駆動部いずれか一方のみで副走査を行ななければならぬ。このようにすれば、ドット記録ヘッドにおいて副走査を行う際は、上流副走査駆動部と下流副走査駆動部いずれか一方のみで副走査を行って印刷を実施する距離を短くすることができると、

【0013】なお、第1の記録モードで実行される副走査送り、1ドット単位の副走査送りであることが好ましい。このようにすれば、ドット記録ヘッドにおいて副走査を行う際の端部に近いノズルで印刷媒体の端部を記録することができると、

【0014】なお、上記のような印刷の際では、印刷媒体に対して、記録すべき画像が、端部印刷が実施される端部を超えて印刷媒体の外側まで設定された画像データを生成し、その画像データに基づいてドットを形成することが好ましい。そのようにすれば、印刷媒体の位置決め誤差が存在する場合にも、印刷媒体の外側に設定された画像に基づいて、想定位置からはみ出た部分の印刷媒体に印刷を行うことができる。

【0015】さらに、画像データにおいて、画像の印刷媒体の端部印刷が実施される端部を超える部分の寸法は、端部の幅未満に設定されることが好ましい。そのようにすれば、印刷媒体の端部印刷が実施される端部を超えて設定される部分を記録するためのインク滴が、印刷媒体上に着弾しなかった場合についても、それらのインク滴を端部内に着弾させるように、印刷媒体をドット記録ヘッドに対して位置決めすることができると、

【0016】なお、本発明は、以下に示すような種々の態様で実現することが可能である。

- (1) ドット記録方法、印刷制御方法、印刷方法。
- (2) ドット記録装置、印刷制御装置、印刷装置。
- (3) 上記の装置や方法を実現するためのコンピュータプログラム。
- (4) 上記の装置や方法を実現するためのコンピュータプログラムを記録した記録媒体。

5

述の課題の少なくとも一部を解決するため、本発明では、インク滴を吐出する複数のドット形成要素が設けられたドット記録ヘッドを用いて印刷媒体の表面にドットの記録を行うドット記録装置を対象として、所定の処理を行う。このドット記録装置は、主走査の行路の少なくとも一部においてドット形成要素と向かい合うように、主走査の方向に延長して設けられ、印刷媒体をドット記録ヘッドと向かい合うように支持し、複数のドット形成要素のうち副走査の方向の両端のうちの少なくとも一方の端に位置するドット形成要素と向かい合う位置に、主走査の方向に延長して設けられる端部を有している、プラテンを備えている。

【0006】そのような印刷装置において実施する印刷(ドットの記録)は、ドット記録ヘッドと印刷媒体の少なくとも一方を駆動して主走査を行い、複数のドット形成要素のうちの少なくとも一部を駆動してドットの形成を行い、主走査の合間に印刷媒体を主走査の方向と交わる方向に駆動して副走査を行うドット記録である。その際、印刷媒体の端部近傍において、第1の記録モードでドットの記録を行うとともに、印刷媒体がプラテンに支持され、かつ、印刷媒体の上端または下端が端部の開口上にあるときに、端部と向かい合う位置にあるドット形成要素の少なくとも一部からインク滴を吐出させて、印刷媒体上にドットを形成する。端部印刷を実施する。そして、印刷媒体の中間部分において、最大の副走査送り量が第1の記録モードにおける最大の副走査送り量より大きい第2の記録モードでドットの記録を行う。

【0007】このように態様とすれば、端部と向かい合う位置にあるドット形成要素を使用し、プラテンにインク滴を着弾させることなく、印刷用紙の端部まで余白なく印刷を行うことができる。

【0008】また、端部印刷を実施する際には、端部と向かい合う位置にあるドット形成要素以外のドット形成要素からはインク滴を吐出させないようにすることが好ましい。このような態様とすれば、印刷媒体の上端の印刷において、それまでの印刷媒体の副走査の送り量が不足で、上端が端部上にまで達しなかった場合、すなわち、印刷媒体の上端がプラテン上に位置し、プラテンの一部が直接ドット記録ヘッドと向き合うこととなった場合にも、プラテンがインク滴によって汚されることなく、印刷媒体の下端の印刷において、印刷媒体の副走査の送り量が過大で、印刷媒体の下端が端部上を通過してしまっただけについても同様である。

【0009】端部を、複数のドット形成要素のうち少なくとも副走査の方向の下流側の端に位置するドット形成要素と向かい合う位置に設けた場合には、印刷媒体の上端が端部の開口上にあるときに、端部印刷を実施することが好ましい。このような態様とすれば、印刷媒体の上端に余白なく画像を記録することができる。

(5) 上記の装置や方法を実現するためのコンピュータプログラムを含み搬送波内に具現化されたデータ信号。

【0017】

【発明の実施の形態】以下で、本発明の実施の形態を、実施例に基づいて以下の順序で説明する。

- A. 実施形態の概要：
- B. 第 1 実施例：
- C. 第 2 実施例：
- D. 第 3 実施例：
- E. 側方溝部を有する形態：
- F. 変形例：

【0018】A、実施形態の概要：図1は、本発明の実施の形態におけるインクジェットプリントの印刷ヘッドの周知の原理を示す断面図である。図1においては、印刷用材料25、25a、25bに保持されて上流側より送り入れられて、送られており（順流送り）、その途中Pが上流側から順流側へ26（上および下）を通過して、下流側の開口に至っている。このとき印刷ヘッド26の

ヘッド28からインク滴1pを吐出して印刷を開始する。印刷用紙Pの前端P1がノズル#1よりも後にあるときに印刷を開始するので、多少の紙送り誤差があっても、印刷用紙Pの前端P2に糸余を作ることなく端まで面像を印刷することができる。印刷用紙P1に押弾しなかったインク滴は、吸引部27rに吸引される。

【0019】印刷用紙Pの前端Pf近傍の印刷の際に、印刷用紙Pの前端部Fと印刷用紙Pとの間に、送りがちである微小な副走送りを繰り返して印刷を行うことが好ましい。そうすることにより、印刷用紙前部部分を下流側部26r上において印刷することが容易となる。

【0020】図2は、印刷用紙Pの下端Prにおける印刷のの様子を示している。図2においては、印刷の最終段階において、印刷用紙Pが下流側紙送りローラ25c、

25dのみに保持されて、送られており、その後端Prが下流側筒部26rの開口の上に至っている。このとき印刷ヘッド28からインク筒を吐出して印刷用紙後端部

の印刷を行う。印刷用紙Pの後端P_rがノズル#8より

[illegible]

より画像処理装置として機能する他、プリンタ222と併せて印刷装置として機能する。このコンピュータ90は、プログラマに従って画像処理に関する動作を制御するための各種画像処理を実行するCPU8を中心に、バス80により相互に接続された次の各部を備える。ROM82は、CPU81で各種画像処理を実行するのに必要な各種プログラムやデータを予め格納しており、ROM83は、同じくCPU81で各種画像処理を実行する際に必要となる各種プログラムやデータが一時的に格納されるメモリである。入力ファンクションキー814、スタートキー815、ポード14からの信号の入力を受け、出力ファンクションキー815は、プリンタ222へのデータ出力を司る。CRT86は、カラー表示可能なCRTディスプレイ21への信号出力を制御し、ディスプレイコントローラ(DC)87は、ハードディスク16やフロッピーディスク15にあるいは図示しないCD-ROMドライブなどの間のデータの授受を制御する。ハードディスク16には、RAM83にロードされて実行される各種プログラムやデータが記憶されている。

【0023】その他、バス80には、シリアル入出力インタフェース(SIO)8が接続されている。このSIO8は、モデム18に接続されており、モデム18を介して、公衆電話回線PNTに接続されている。コンピュータ90は、このSIO8およびモデム18を介して、外部のネットワークに接続されており、特定のサービスに接続することにより、画像処理に必要なプログラムをハードディスク16にダウンロードすることが可能である。また、必要なプログラムをフレキシブルディスク91やCD-ROMよりロードし、コンピュータ90に実行させることも可能である。

【0024】図4は、本明細書中のソフトウェアの構成を示すブロック図である。コンピュータ90では、所定のオペレーティングシステムの下で、アプリケーションプログラム95が動作している。オペレーティングシステムには、ビデオドライバ91やプリンタドライバ96が組み込まれており、アプリケーションプログラム95からは、これらのドライバを介して、プリンタ22に転送するための画像データが出力されることになる。画像のレタナチなどを行うアプリケーションプログラム95は、スキナ12から転送込み、これに対して所定の処理を行う一つビデオドライバ91を介してCR T21に画像を表示している。スキナ12から供給されるデータORGは、カラー原稿から読み取られる(R)、グリーン(G)、ブルー(B)の3色の色成分からなる原カラー画像データORGである。

【0025】このアプリケーションプログラム95が、印刷命令を発すると、コンピュータ90のプリンタドライバ96が、画像データをアプリケーションプログラム95から受け取り、これをプリンタ22が処理可能な値

れ、キャリアジ31を摺動可能に保持する摺動軸34とキャリアジモータ24との間に無端の駆動ベルト36を張設するブリー38と、キャリアジ31の原点位置を検出する位置検出センサ39等から構成されている。

【0030】キャリアッジ31には、黒インク(K)用のカートリッジ71とシアン(C)、ライトシアン(L)C)、マゼンタ(M)、ライトマゼンダ(LM)、イエロー(Y)の6色のインクを収納したカラーインク用カートリッジ72が格納可能である。キャリアッジ31の下部の印刷ヘッド28には計6個のインク吐出用ヘッド61ないし66が形成されており、キャリアッジ31の底面には、この6色毎にヘッドにインクタンクからのインクを導く導入管67が立設されている。キャリアッジ31に黒(K)インク用のカートリッジ71およびカラーインク用カートリッジ72を上方から装着すると、各カートリッジに設けられた挿孔1に導入管67が挿入され、各インクカートリッジから吐出用ヘッド61ないし66へのインクの供給が可能となる。

【0031】キヤリッジ31下部に設けられた各色のズルZが6色に、各色ごとに48個のズルNZが設けられており、各ズル毎に、電圧線子の一つであって多量性に塗られたビエノ菓子P Eが配置されている。ビエノ菓子P Eは、ズルNZまでインクを導くインク通路に接する位置に配置されている。ビエノ菓子P Eは、周知の電圧、特に電圧の印加により結露構造が空へ、極めて急速に電気、機械エネルギーの変換を行う菓子P Eである。本実施例では、ビエノ菓子P Eの両面に設けられた電圧線に所定時間間の電圧を印加することにより、ビエノ菓子P Eが電圧の印加時間だけ伸張し、インク通路の一部を変形させる。この結果、インク通路68はビエノ菓子P Eの伸張に応じて取捨し、この取捨分にはビエノ菓子P Eの伸張に匹敵して取捨し、この取捨分に相当するインクが、粒子pとなって、ズルNZの先端から速速に吐出される。このインク粒子pがプラチナ26に塗着された用紙に染み込むことにより、印刷が行われる。

【0032】図6は、インク吐出用ヘッド61〜66におけるインクジェットノズルNzの配列を示す説明図である。これらのノズルの配列は、ブラック(K)、シア(C)、ライトシア(LC)、マゼンタ(M)、ラシオン(C)、ライオン(L)、イエロ(Y)各色とそれにインクイットマゼンタ(LM)、イエロ(Y)各色とそれにインクイエロを吐出する6組のノズルレイアウトから成っており、それぞれ48個のノズルが一定のノズルピッチで一列に配列されている。なお、「ノズルピッチ」とは、印刷ヘッド分々に配列するノズルの間隔を方向の異なる何ラスタ分(すなわち、何画素分)であるかを示す値である。例えば、間に3ラスタ分の間隔をあけて配列されているノズルのピッチkは4である。

【0033】図7は、プラテン26の周辺を示す平面図である。プラテン26は、主走査の方向に、このプリンタ22で使用可能な印刷用紙Pの最大幅よりも長く設け

号(ここではラン、マゼンタ、ライトシアン、ライトブルー)に数値を付したものを多値に書き換えて、ラン、マゼンタ、イエロ、ブラックの色名については、アルファチャンネルに格納された番号)に一致した明度は、解像度変換モジュール9.7と、色補正モジュール9.8と、ハーフトーンモジュール9.9と、ラタラライザ10.0が働かされている。また、色補正テーブルUT、ドット形成パターンテーブルDTMも記憶されている。なお、アプリケーションプログラム9.5が特殊要求の範囲にいう「画像データ生成部」に相当する。

【0026】解像度変換モジュール97は、アプリケーションプログラム95が扱っているカラー画像データの解像度、即ち、単位長さ当たりの画素数をプリンタドライバ96が扱うことができる解像度に変換する役割を果たす。ここで、解像度変換される画像データは、まだRGBの3色からなる画像情報であるから、色補正モジュール98は色補正テーブルLUTを参照しつつ、各画素ごとにプリンタ22が使用するアン(C)、マゼンタ(M)、ライトシアン(LC)、ライトマゼンタ(LM)、イエロ(Y)、ブラック(K)の各色のデータに変換する。

【0002.7】色補正されたデータは、例えば255色補正等の場で階調値を有している。ハーフトーンモジュール992は、データPを分散して形成することによりプリンタデータ9992で、この階調値を表現するためのハーフトーン処理を実行する。ハーフトーンモジュール999は、ドット形成パターンP1Tを生成することにより、画像処理部990の階調値に対応して、それぞれインクドットPのドット形成パターンを設定した上で、ハーフトーン処理を真正実行する。このようにして処理された画像データは、ラスタライザ100によりプリンタデータ22に転送すべきデータ順に並べ替えられ、最終的な印刷データPDとして出力される。印刷データPDは、各走査時のドットの階調状態を表すラスタデータと駆動注送量を示すデータとを合致させて、各走査時のドットを形成する役割を果たすのみである。本実施例では、プリンタデータ22は印刷データPDに倣った印刷データドットを形成する役割を果たすのみであり、画像処理部990は、プリンタデータ22の処理をプリンタデータ22で行うものとしても差し支えない。

【0028】次に、図5によりプリンタ220の図5a構成を説明する。図5aに、このプリンタ22は、紙送りモータ24によって用紙Pを搬送する機構と、キャラクターモータ24によってキャラクター31をクランク216の端方位置に往復動させる機構と、キャラクター31の端方位置に往復動させる機構と、キャラクター31に格納された印刷ヘッド28を駆動してインクの吐出およびインクドット28の形成を行う機構と、これらの駆動リモータ23、キャラクターモータ24、印刷ヘッド28および操作パネル32と2の信号のやり取りを司る制御回路40とから構成されている。

【0029】キャリアッジ31をプラテン26の軸方向に往復動させる機構は、プラテン26の軸と平行に架設さ

られている。そして、プラテン26の上面には、上流側紙送りローラ25a、25bが設けられている。上流側紙送りローラ25a、25bは自由回転する複数の小ローラである。また、プラテン26の下流には、下流側紙送りローラ25c、25dが設けられている。下流側紙送りローラ25cが駆動軸に設けられた歯車のローラで送りローラ25dは自由回転する複数の小ローラである。下流側紙送りローラ25dの外周面には、回転軸方向に平行に歯が設けられている。すなわち、下流側紙送りローラ25dは、外周面に放射状に歯(歯と歯の間の部分)を有しており、回転軸方向から見ると歯の形状に見える。この下流側紙送りローラ25dは、通称「ギザローラ」と呼ばれ、印刷用紙Pをプラテン26上に押しつける役割を果たす。なお、下流側紙送りローラ25cと上流側紙送りローラ25aと上流側紙送りローラ25bは、外周面に放射状に歯を有している。この下流側紙送りローラ25c、25dはそれぞれ上流側紙送りローラ25a、25bおよび下流側紙送りローラ25c、25dに保持され、その間の部分をプラテン26の上面によって印刷ヘッド28のノズル列と向かい合うように支持される。そして、上流側紙送りローラ25a、25bおよび下流側紙送りローラ25c、25dによって副走査送りを実施され、印刷ヘッド28のノズルから吐出されるインクにより階調画像を記録される。なお、この上流側紙送りローラ25a、25dが特許請求の範囲において「上流側印刷走査駆動部」であり、下流側紙送りローラ25c、25dが特許請求の範囲という「下流側印刷走査駆動部」である。

【0035】また、プラテン26には、副走査方向の上流側および下流側にそれぞれ上流側歯部26fと下流側歯部26gが設けられている。上流側歯部26fと下流側歯部26gは、それぞれ副走査方向に沿って、このプラテン26で使用可能な印刷用紙Pの最大幅よりも長く設けられている。また、これら上流側歯部26fと下流側歯部26gの底面にはそれぞれインク滴1pを受け、これを受取するための受取部材27f、27gが配されている。そして、下流側歯部26gは、印刷ヘッド28上のノズルN2のうち最下流のノズルを含む下流側の一部のノズル群Nr(図7において斜線で示す部分)のノズルと向かい合う位置に設けられている。そして、上流側歯部26fは、印刷ヘッド28上のノズルN1のうち最上流のノズルを含む上流側の一部のノズル群Nf(図7において図示せず)と向かい合う位置に設けられている。

印刷用紙Pは、上流側紙送りローラ25a、25bおよび下流側紙送りローラ25c、25dによって副走査送りを実施されているときには、これら上流側歯部26f

ルを有するものとする。副走査の際には、各ノズルが一つのラスタの記録を担当する。ここで、「ラスタ」とは、副走査方向に並ぶ画素の列である。そして、「画素」とは、インク滴を調整させたドットを記録する位置を規定するために、印刷媒体上に仮想的に定められた方眼状の升目である。ここでは、各ノズルは3ラスタ分の間隔をあけて配されているものとする。

【0043】図8において、縦に並ぶ1列の升目は、印刷ヘッド28を表している。各升目の中の1〜8の数字が、ノズル番号を示している。明細書中では、これらの番号に「#」を付けて各ノズルを表す。図8では、時間とともに副走査方向に相対的に送られる印刷ヘッド28を、順に左から右にずらして示している。図8に示すように、上端処理においては、1ドットづつの副走査送りを7回繰り返す。この上端処理が、特許請求の範囲にいう「第1の記録モード」における印刷である。なお、副走査送り量の単位の「ドット」は、副走査方向の印刷解像度に対する1ドット分のピッチを意味しており、これはラスタのピッチとも等しい。

【0044】その後、中間処理に移行して、5ドット、2ドット、3ドット、6ドットの送りをその順に繰り返す。この中間処理が、特許請求の範囲にいう「第2の記録モード」における印刷である。このように異なる送り量を組み合わせた副走査を行う方式を「変則送り」という。上記のような副走査送りを実施すると、一部のラスタを除き、各ラスタはそれぞれ二つのノズルで記録される。すなわち、本実施例では、各ラスタは、二つのノズルで印刷される。例えば、図8において、上から5番目のラスタは、#2のノズルと#1のノズルとで記録される。この際、#2のノズルは例えば偶数アドレスの画素を記録し、#1のノズルは奇数アドレスの画素を記録する。また、上から9番目のラスタは、#3のノズルと#2のノズルとで記録される。このように、一つのラスタ内の画素を複数のノズルで分担して印刷する方式を「オーバーラップ印刷」という。オーバーラップ印刷においては、一つのラスタは、印刷ヘッドに対する印刷用紙の副走査方向の位置が互いに異なる複数回の副走査において、そのラスタ上を通過する複数のノズルによってドットを記録される。

【0045】一方、図8において、最上段から4本のラスタは、印刷の際に副走査において#1のノズルが1度通過するだけである。したがって、これらのラスタについては、二つのノズルで画素を分担して印刷することができない。よって、本実施例では、これら4本のラスタは、画像を記録するために使用することはしないものとする。すなわち、本実施例において画像を記録するために使用できるラスタは、印刷ヘッド28上のノズルがドットを記録しうるラスタのうち、副走査方向上流の端から5番目以降のラスタとする。この画像を記録するため、図8に示すラスタの領域を「印刷可能領域」と呼ぶ。

また、画像記録のために使用しないラスタの領域を「印刷不可領域」と呼ぶ。図8においては、印刷ヘッド28上のノズルがドットを記録しうるラスタについて、上から順に付した番号を、図の左側に記載している。以降、上端処理のドットの記録を説明する図面においても同様である。なお、図において太線で囲まれたノズルが、ラスタにドットを記録するノズルである。

【0046】また、図8において、上から13番目より15番目のラスタは、印刷の際の副走査において3個のノズルが通過する。そのような、印刷において三つ以上のノズルが通過するラスタについては、その中の二つのノズルのみがドットを記録するものとする。それらのラスタは、できるだけ中間処理に移行した後にそのラスタ上を通過するノズルで記録することが好ましい。中間処理においては、変則送りが行われており、隣り合うラスタ上を通過するノズルの組み合わせが違ってくるため、1ドットづつの定則送りが行われる上端処理に比べて、印刷結果が画面上となることが期待できるからである。

【0047】本実施例では、印刷用紙の上端まで余白なく画像を記録する。前述のように、本実施例においては、印刷ヘッド28上のノズルがドットを記録しうるラスタのうち、副走査方向上流の端から5番目以降のラスタ(印刷可能領域)を使用して、画像を記録することができ、したがって、印刷用紙の上端よりずり位置に上端端から5番目のラスタが位置するように、印刷ヘッド28に対して印刷用紙を配置してドットの記録を開始することとすれば、理論上は、印刷用紙の上端いっぱいまで画像を記録することができる。しかし、副走査送りの際には送り量について調整が生じる場合がある。また、印刷ヘッド28の製造誤差などによりインク滴の吐出方向がずれる場合もある。そのような理由から印刷用紙上へのインク滴の飛弾位置がずれた場合についても、印刷用紙の上端に余白が生じないようにすることが好ましい。よって本実施例では、印刷に使用する画像データDは、印刷ヘッド28上のノズルがドットを記録しうるラスタのうち、副走査方向上流の端から5番目のラスタから設定し、一方で、印刷用紙Pの上端が、副走査方向上流の端から7番目のラスタの位置にある状態から印刷を開始することとする。したがって、印刷開始時の各ラスタに対する印刷用紙Pの上端の指定位置は、図8に示すように、副走査方向上流の端から7番目のラスタの位置である。

【0048】図9は、画像データDと印刷用紙Pとの関係を示す平面図である。上述のように、本実施例では、印刷用紙Pの上端Pfを超えて印刷用紙Pの外側で画像データDを設定する。また、下端側についても、同様理由から、印刷用紙Pの下端Prを超えて印刷用紙Pの外側まで画像データDを設定する。したがって、本実施例においては、画像データDと印刷用紙Pの配置の関係、及び印刷時の画像データDと印刷用紙Pの位置の関係

は、図9に示すようになる。本実施例では、印刷用紙Pの上端P fを超えて印刷用紙Pの外周まで設定する画像データDの部分の幅は、2ラスタ分である。また、印刷用紙Pの下端P rを超えて印刷用紙Pの外周まで設定する画像データDの部分の幅も、同様に2ラスタ分である。

なお、本明細書では、印刷用紙Pに記録する画像データは、印刷用紙Pの上端が印刷可能領域の上から2番目のラスタや、印刷可能領域の最上段のラスタの位置に来てしまいう場合もある。本実施例では、そのような場合でも、＃1、＃2のノズルがそれらのラスタに対してインク滴1 pを吐出しているため、印刷用紙Pの上端に画像を記録することができ、余白ができてしまうことがない。すなわち、印刷用紙Pが本来の送り量よりも多く送られてしまった場合でも、図10において一価領域で示すように、その余分の送り量が2ラスタ分以下である場合には、印刷用紙Pの上端に余白ができてしまうことがない。

【0053】逆に、何らかの理由により、印刷用紙Pが本来の送り量よりも少なく送られてしまうことも考えられる。そのような場合には、本来印刷用紙があるべき位置に印刷用紙がないこととなり、インク滴1 pが下方の紙造物に着弾してしまうこととなる。しかし、図8に示すように、本実施例においては、用紙の想定上端位置から2ラスタは、＃1と＃2のノズルで記録されることになっている。これらのノズルの下方には下流側部26 rが設けられており、仮に、インク滴1 pが印刷用紙Pに着弾しなかったとしても、そのインク滴1 pは下流側部26 rに落下し、吸収部材27 rに吸収されることとなる。したがって、インク滴1 pがプラテン26上面部に着弾しても、のちに印刷用紙を汚すことはない。すな

わち、本実施例においては、印刷開始時には、印刷用紙Pの上端P fが想定上端位置よりも後ろにある場合でも、想定上端位置からのずれ量が2ラスタ以下である場合には、インク滴1 pがプラテン26上面部に着弾して、のちに印刷用紙Pを汚すことはない。

【0054】印刷用紙Pは、上流側紙送りローラ25 a、25 bおよび下流側紙送りローラ25 c、25 dの二組のローラにより保持され、副走送りがされることを望ましい。一方のローラのみで保持され、副走送りがされる場合に比べ、より正確に副走送りをすることができるとする。したがって、印刷用紙の上端P fを印刷する際には、印刷用紙Pは上流側紙送りローラ25 a、25 bのみによって保持され、副走送りをされる。本実施例においては、印刷ヘッド28上のノズルがドットを記録しうるラスタのうち副走送方向上流の端から7番目のラスタの位置に、印刷用紙の上端P fが位置する状態で印刷を開始する(図8および図10参照)。したがって、図10に示すように、その位置から、印刷用紙上端P fが下流側紙送りローラ25 c、25 dに保持されるまでのあいだ、すなわち、L31の距離だけ印刷用紙が送られる間、上流側紙送りローラ25 a、25 bのみに

よって副走送りがされ、印刷が実行される。本実施例においては、この上流側紙送りローラ25 a、25 bのみによって副走送りがされ、印刷が実行される区画が比較的に短い。印刷結果が高画質となる。なお、上記のような態様に限らず、副走送方向の下流側の端の近傍のノズルで印刷用紙の上端P f近傍を印刷する態様とすれば、上記の効果も奏することができ、そして、特に、上流側走査駆動部(上流側紙送りローラ25 a、25 b)の送り精度が比較的に低い場合に有効である。

【0055】さらに、上端部分の印刷を行う際、印刷用紙Pは、上流側紙送りローラ25 a、25 bとプラテン26の上面の2か所で支えられている。このため下流側部26 r上において比較的、印刷用紙Pの上端部分が下方に傾みにく。よって、印刷用紙の傾みによって上端部分の印刷結果の品質が悪化する可能性が小さい。

【0056】(11)比較例の上端送り：図11は、比較例における印刷開始時の印刷ヘッド28と印刷用紙Pの関係を示す側面図である。図11に示すように、上流側部26 fにおいて印刷用紙Pの上端部分を印刷しても、印刷用紙P上に着弾しなかったインク滴は、プラテン26の上面に着弾することとなる。しかし、この比較例では、印刷用紙の上端部分の印刷を開始してから、印刷用紙上端が下流側紙送りローラ25 c、25 dに保持されるまで、印刷用紙が送られる距離L32(図11参照)が、実施例の場合(図8のL31)に比べて長い。すなわち、上流側紙送りローラ25 a、25 bのみによって副走送りがされ、印刷が実行される区画が比較的に短い。このため、印刷結果の品質が実施例に比べて低い。

【0057】また、上端部分の印刷を行う際、印刷用紙Pは、上流側紙送りローラ25 a、25 bのみによって保持されている。このため、上流側部26 f上において印刷用紙Pの上端部分が下方に傾みやすい。よって、上端部分の印刷の際に、印刷結果の品質が低下する可能性が比較的大きい。

【0058】(11)第1実施例の下端処理：図12は、下端処理において、各ラスタがどのノズルによってどのように記録されていくかを示す説明図である。図12においては、n+1回目の副走送りが行われたところから最後は、n+17回目の副走送りをするとところまでを示している。本実施例では、図12に示すように、中間処理においてn+8回目までの副走送りで5ドット、2ドット、3ドット、6ドットの送りとなる順に繰返し9回、下端処理において、最後の9回、すなわちn+9回目からn+17回目までの副走送りを、1ドットづつの送りで行う。その結果、主走査方向に沿った各ラスタは、一部のみを除いてそれぞれ二つのノズルで記録される。なお、図12においては、印刷ヘッド28上のノズルがドットを記録しうるラスタについて、下から順に付した番号を、図の右側に記載している。以下

降、下端処理のドットの記録を説明する図面において同様である。

【0059】図12において、最下段から4本のラスタは、印刷において＃8のノズルが1度通過するだけである。最下段から5本目以上は、印刷用紙の下端部において記録される。したがって、印刷用紙の下端部分における印刷可能領域は、最下段から5本目以上のラスタの領域である。

【0060】また、図12において、下から9番目より0番目のラスタなどは、印刷の際の主走査において3以上のノズルが通過する。そのような、印刷において3つ以上のノズルが通過するラスタについては、できるだけ中間処理においてそのラスタ上を通過するノズルで記録することが好ましい。1ドットづつの定則送りが行われる下端処理に比べて、印刷結果が高画質となることを期待できるからである。

【0061】本実施例では、上端の場合と同様、下端に於いても余白なく画像を記録する。前述のように、本実施例においては、印刷ヘッド28上のノズルがドットを記録しうるラスタのうち、副走査方向下流の端から5番目以上のラスタ(印刷可能領域)を使用して、画像を記録することができる。しかし、副走送りの際に送り量について誤差が生じる場合等を考慮して、副走査方向下流の端から7番目のラスタから印刷用紙上に記録するものとす。すなわち、印刷用紙の下端が、副走査方向上流の端から7番目のラスタの位置にある状態で、5番目と6番目のラスタについてもインク滴1 pの吐出を行い、印刷の際の主走査を行う。したがって、印刷終了時の各ラスタに対する印刷用紙下端の想定位置は、図12に示すように、副走査方向下流の端から7番目のラスタの位置である。

【0062】図13は、印刷用紙Pの下端部P rの印刷をする際の上流側部26 fと印刷用紙Pの関係を示す側面図である。図13において、印刷ヘッド28の斜線で示した部分のノズル群N fが、＃7、＃8のノズルが位置する部分である。主走査の際にこれらのノズルが通過する部分の下方には、上流側部26 fが設けられており、上流側部26 fの上の一点領域で示す位置に印刷用紙Pの下端P rがあるときに、印刷を終了する。

【0063】図14は、印刷用紙Pの下端部P rの印刷をする際、印刷ヘッド28と印刷用紙Pの関係を示す側面図である。前述のように、印刷用紙Pの下端部P rの印刷をする際、印刷用紙Pの下端P rは、印刷ヘッド28上のノズルがドットを記録しうるラスタのうち、副走査方向下流の端から7番目のラスタの位置にある(図12参照)。すなわち、印刷用紙Pの下端は、＃8のノズルから数えて6ラスタ分前の位置にあることとなる。したがって、この状態で、印刷可能領域の最下段および最下段から2番目のラスタ(図12において、下から6番目および5番目のラスタ)の記録を行うこととすると、

7、#8のノズルから吐出されたインク滴1pは、そのまま上流側補助26fに落下することとなる。

【0064】また、何らかの理由により、印刷用紙Pが本来の送り量より少なく送られてしまった場合に、#7、#8のノズルが印刷用紙Pの下端Prを超えて、既定されるラスト(図12において、下から5番目および6番目のラスト)に対してインク滴1pを吐出しているとき、印刷用紙Pの下端Prに画像を記録することができ、余白ができてしまうことがない。すなわち、図12において、下から5番目から4番目のラスト分以下である場合には、印刷用紙Pの下端に余白ができてしまうことがない。

【0065】そして、用紙の規定上端位置から上の2ラスタ(図12において、下から7番目および8番目のラスタ)は、#7と#8のノズルで記録されることとなっている。よって、何らかの理由により、印刷用紙Pが本来の送り量よりも多く送られてしまった場合にも、吐出されたインク滴1pは上流側補助26fに落下し、ブラテン26上面部に留まる可能性がある。

【0066】また、本実施例においては、印刷ヘッド28上のノズルがドットを記録するラスタのうち、副走方向下流側の端から7番目のラスタの位置(すなわち、図14において、ノズル#7の2ラスタ分前の位置)に、印刷用紙の下端Prが位置する状態では印刷用紙上の最後のラスタを記録し印刷を終了する(図12参照)。したがって、印刷用紙Pの下端Prが上流側補助26fから5a、25bを離れてから図14に示す位置までの、L41の距離だけ印刷用紙Pが送られる間、下流側補助26fの25c、25dのみによって副走送りがされ、印刷が実行される。本実施例においては、この下流側補助26fの25c、25dのみによって副走送りがされ、印刷が実行される区間が比較的短い。印刷結果が歪みとなる。特に、下流側補助26fの25dは車状のローラーであり、下流側補助26fの25c、25dの組み合わせは上流側補助26fの25a、25bに比べて送り精度が低い。このため、下流側補助26fの25c、25dのみによって副走送りがされ、印刷が実行される区間が比較的短いことは、印刷結果の品質向上に大変有効である。なお、上記のような状態に限らず、副走方向の上流側の端の近傍のノズルで印刷用紙の下端Pr近傍を印刷する態様とすれば、上記の効果を奏することができる。そして、特に、下流側補助26fの25c、25dの送り精度が比較的低い場合に有効である。

【0067】さらに、下流側補助26fの25c、25dとブラテン26の上面2f所を支えられている。このため上流側補助26f上において比較的、印刷用紙Pの下端部分が下方に傾みにくい。よって、印刷用紙の傾みによって上流側補助26fの25c、25dの送り精度が小さい。このため、比較例においては、図15は、比較例における印刷用紙Pの下端Prの印刷をする際の印刷ヘッド28と印刷用紙Pの関係を示す側面図である。図15に示すように、下流側補助26fにおいて印刷用紙Pの下端部分が印刷して、印刷用紙P上に留まったインク滴は、ブラテン26の上面に留まることはない。しかし、比較例では、図15に示すように、印刷用紙Pの下端が上流側補助26fの25a、25bを離れてから印刷が終了するまでに、印刷用紙が送られる距離L42が、実施例の場合(図14のL41)に比べて長い。すなわち、比較例の送り精度が低い下流側補助26fの25c、25dのみによって副走送りがされ、印刷が実行される区間が短い。このため、印刷結果の品質が実施例に比べて低い。

【0069】また、下流側補助26fの25c、25dのみによって印刷ヘッド28aと上流側補助26fの25aおよび下流側補助26fの25c、25dのみによって保持されている。このため、下流側補助26f上において印刷用紙Pの下端部分が下方に傾みやすい。よって、下流側補助26fの印刷の際に、印刷結果の品質が低下する可能性がある。

【0070】C. 第2実施例：図16は、第2実施例における印刷ヘッド28aと上流側補助26fおよび下流側補助26fの関係を示す側面図である。ここで、1列のノズル列が11個のノズルを有する印刷装置において上流側補助26fの下端処理を行う場合に説明する。ここで使用する印刷装置では、下流側補助26fは、副走方向について、ノズル#1～#3と向かい合う位置に設けられる。また、上流側補助26fは、ノズル#9～#11と向かい合う位置に設けられ、他の点はすでに説明した印刷装置と同様の構成である。また、この第2実施例では、オーバーラップ印刷を行わない。すなわち、各ラスタは1度の主走において一つのノズルで記録される。

【0071】(1) 第2実施例の上端処理：図17および図18は、第2実施例の上端処理において、各ラスタがどのノズルによってどのように記録されていくかを示す説明図である。図17と図18は、ヘッドがラスタを記録していく様子を上下二つに分けて示している。図17の下部が、図18の上部に示している。なお、上から3番目から4番目までのラスタは、図17および図18において重複して記載されている。

【0072】図17に示すように、第2実施例の上端処理においては、3ドットづつの副走送りを11回繰り返す。この上端処理が、特許請求の範囲にいう「第1の記録モード」における印刷である。この上端処理においては、印刷ヘッド28aの#1～#3のノズル以外のノズルは使用されない。なお、図において太枠で囲まれたノズルが、ラスタにドットを記録するノズルである。

【0073】その後、すぐに中間処理を行うのではなく、中間処理を行う前に「移行処理」が行われる。この

移行処理においては、上端処理のときと同じく3ドットづつの副走送りが行われる。移行処理においては、#1～#11のすべてのノズルが使用される。その後、図18に示すように、中間処理に移行して、11ドットの定期送りによって、中間処理が、特許請求の範囲にいう「第2の記録モード」における印刷である。

【0074】図17において、最上段から2番目、3番目、6番目のラスタは、印刷の主走においてノズルが通過しない。したがって、最上段から6番目までのラスタについては、隣り合うラスタに連続して画像を印刷することができない。本実施例では、これら6本のラスタが「印刷不可領域」である。また、上から13番目や16番目のラスタのような、2以上のノズルが通過するラスタについては、最後に2ラスタを通過するノズルのみがドットを記録するものとする。

【0075】第2実施例では、印刷ヘッド28a上のノズルがドットを記録するラスタのうち、副走方向上流側の端から7番目以降のラスタ(印刷可能領域)を使用して、画像を記録することができる。よって、印刷に使用する画像データDは、副走方向上流側の端から7番目のラスタから設定される。しかし、第1実施例と同様の理由から、印刷は、印刷用紙Pの上端が副走方向上流側の端から7番目の位置にあるときから開始する。すなわち、印刷開始時の各ラスタに対する印刷用紙Pの上端の固定位置は、図17に示すように、副走方向上流側の端から23番目のラスタの位置である。よって、第2実施例においては、想定される印刷用紙Pの上端の位置を越えて16ラスタ分だけ画像データDが設けられる。このため、印刷用紙Pの送りに誤差が生じて印刷用紙Pが余分に送られてしまっても、その誤差が16ラスタ分以内であれば、印刷用紙Pの上端で余白なく画像を形成することができる。

【0076】また、第2実施例においては、想定される印刷用紙Pの上端の位置を越えて設定される16ラスタ、および上流側の端から20ラスタはノズル#1～#3のみで記録される。そして、ノズル#1～#3の下流側には、下流側補助26fが設けられている。よって、印刷用紙Pの上端の固定位置をこえて(すなわち、印刷用紙が所定の範囲内)に設定された、上述の16ラスタに対してインク滴を吐出しても、ブラテン26a上にインク滴を留まらせてしまうことがない。また、印刷用紙Pの送りに誤差が生じて印刷用紙Pが固定位置まで送られなかった状態で、印刷用紙Pの上端部に割り当てられたラスタに対してインク滴を吐出しても、送りの誤差が20ラスタ分以内であれば、ブラテン26a上にインク滴を留まらせてしまうことがない。

【0077】(2) 第2実施例の下端処理：図19および図20は、第2実施例の下端処理において、各ラスタがどのノズルによってどのように記録されていくかを示す説明図である。図19において、下流側補助26fの25c、25dのみによって副走送りがされ、印刷が実行される。本実施例においては、この下流側補助26fの25c、25dのみによって副走送りがされ、印刷が実行される区間が比較的短い。印刷結果が歪みとなる。特に、下流側補助26fの25dは車状のローラーであり、下流側補助26fの25c、25dの組み合わせは上流側補助26fの25a、25bに比べて送り精度が低い。このため、下流側補助26fの25c、25dのみによって副走送りがされ、印刷が実行される区間が比較的短いことは、印刷結果の品質向上に大変有効である。なお、上記のような状態に限らず、副走方向の上流側の端の近傍のノズルで印刷用紙の下端Pr近傍を印刷する態様とすれば、上記の効果を奏することができる。そして、特に、下流側補助26fの25c、25dの送り精度が比較的低い場合に有効である。

【0078】本実施例では、図19および図20に示すように、中間処理においてn+1回目からn+3回目までの副走送りで11ドットの定期送りを繰り返す。そして、その後、下端処理において、ノズル#9～#11のみを使用して3ドットの送りを行う。

【0079】なお、第2実施例では、図20に示すように、印刷ヘッド28a上のノズルがドットを記録するラスタのうち、下から7番目以上のラスタ(印刷可能領域)を使用して画像を記録することができる。しかし、第2実施例では、下から8番目以上のラスタを使用して画像を記録する。すなわち、図20の下から8番目以上のラスタが印刷領域であり、それらのラスタに対して画像データが設定される。

【0080】また、図20において、下から13番目や16番目などのラスタは、印刷の主走において2個以上のノズルが通過する。そのような、印刷において2以上のノズルが通過するラスタについては、最初そのラスタ上を通過するノズルがドットを記録する。

【0081】第2実施例では、印刷ヘッド28a上のノズルがドットを記録するラスタのうち、副走方向下流側の端から8番目以上のラスタを使用し、画像を記録することができる。よって、印刷に使用する画像データDは、この8番目のラスタまで設定する。しかし、第1実施例と同様の理由から、印刷は、印刷用紙Pの下端が副走方向下流側の端から8番目の位置にあるときを終了する。すなわち、印刷終了時の各ラスタに対する印刷用紙Pの下端の固定位置は、図20に示すように、副走方向下流側の端から38番目のラスタの位置である。よって、第2実施例においては、想定される印刷用紙Pの下端の位置を越えて30ラスタ分だけ画像データDが設けられている。このため、印刷用紙Pの送りに誤差が生じて印刷用紙Pが固定位置まで送られなくても、その誤差が30ラスタ分以内であれば、下端で余白なく画像を形成することができる。

【0082】また、第2実施例においては、想定される印刷用紙Pの下端の位置を越えて設定される30ラスタ、および下流側の端から上流側の20ラスタはノズル#9～#11のみで記録される。そして、ノズル#9～#11の下流側には、上流側補助26fが設けられている。よって、印刷用紙Pの下端の固定位置をこえて(すなわち、印刷用紙が所定の範囲内)に設定された、上述の16ラスタに対してインク滴を吐出しても、ブラテン26a上にインク滴を留まらせてしまうことがない。また、印刷用紙Pの送りに誤差が生じて印刷用紙Pが固定位置まで送られなかった状態で、印刷用紙Pの上端部に割り当てられたラスタに対してインク滴を吐出しても、送りの誤差が20ラスタ分以内であれば、ブラテン26a上にインク滴を留まらせてしまうことがない。

【0077】(2) 第2実施例の下端処理：図19および図20は、第2実施例の下端処理において、各ラスタ

する。印刷終了時の各ラスタに対する印刷用紙Pの下端の想定位置を、図26に示す。よって、第3実施例においては、想定される印刷用紙Pの下端の位置を越えて40ラスタ分だけ画像データDが駆けられている。このため、印刷用紙Pの送りに調整が生じて印刷用紙Pが想定位置まで送られなくても、その調整が40ラスタ分以内であれば、下端まで余白なく画像を形成することができ

る。

【0097】また、第3実施例においては、想定される印刷用紙Pの下端の位置を越えて設定される40ラスタ、および下端の位置から上流側の36ラスタ、上流側端部26f b上のノズル#37～#48のみで記録される。よって、印刷用紙Pの下端の想定位置をこえて（すなわち、印刷用紙が存在しない範囲に）設定されたラスタに対してインク滴を吐出しても、プラテン26b上にインク滴を蓄積させてしまうことがない。また、印刷用紙Pの送りに調整が生じて印刷用紙Pが余分に送られてしまった状態で、印刷用紙Pの下端部に割り当てられたラスタに対してインク滴を吐出しても、送りの調整が36ラスタ分以内であれば、プラテン26a上にインク滴を蓄積させてしまうことがない。

【0098】なお、第3実施例においても、印刷用紙Pの下端部において上流側端部26f b上のノズル（#37～#48）のみによって記録されるラスタの数、印刷用紙Pの上端部において下流側端部26r b上のノズル（#1～#12）のみによって記録されるラスタの数よりも多く設定している。そして、画像データDにおいて、印刷用紙Pの下端をこえて設定するラスタの数、印刷用紙Pの上端をこえて設定するラスタの数よりも多く設定している。

【0099】E. 側方端部を有する記録：上記では、図7に示すように、プラテン26に上流側端部26fと下流側端部26rを有するプリンタ22において、印刷用紙Pの上下端を越えて設定される画像データD（図9参照）に基づいて、印刷を行う記録について説明した。ここでは、上流側端部26f、下流側端部26rに加えて、印刷用紙Pの左右端部26na、右側端部26nbをプラテンに有するプリンタ22において、印刷用紙Pの上下端および左右端を越えて設定される画像データDnに基づいて、印刷を行う記録について説明する。

【0100】図27は、画像データDnと印刷用紙Pとの関係を示す平面図である。図27では、画像データDnは、印刷用紙Pの上端P f、下端P rだけでなく、左側端部Pa、右側端部Pbを越えて、印刷用紙Pの外側まで設定される。その結果、本実施例においては、画像データDnと印刷用紙Pの大きさ、及び印刷時の画像データDnの想定位置と印刷用紙Pの配置の関係は、図27に示すようになる。この画像データDnによって記録できる画像の幅（記録領域の幅）は、印刷用紙Pの左右端を越える幅を有し、かつ、左側端部26naと右側端

刷ヘッド28bを用いてオーバーラップ印刷を行う。

【0086】（1）第3実施例の上端処理：図23および図24は、第3実施例の上端処理において、各ラスタがどのノズルによってどのように記録されていくかを示す説明図である。図23の下部が、図24の上端に付なされる。なお、上から6番目から74番目までのラスタは、図23に示すように、第3実施例の上端処理においては、6ドットづつの副走査送りを行う「第1の副走査モード」における印刷である。この上端処理においては、印刷ヘッド28bの#1～#12のノズル以外のノズルは使用されない。図において太線で囲まれたノズルが、ラスタにドットを記録するノズルである。上端処理で使用するノズルは、図22においてノズル群N1として示されるノズルである。

【0088】その後、「移行処理」が行われる。この移行処理においては、上端処理のときと同じく6ドットの副走査送りが2回行われる。移行処理においては、最初の送りの後には、上端処理のときと同じく#1～#12のノズルでドットが記録される。そして、2回目の送りの後には、#1～#30ノズルが使用される。その後、図24に示すように、中間処理に移行して、24ドットの副走査送りが行われる。中間処理においては、#1～#48のすべてのノズルが使用される。この中間処理が、特許請求の範囲にいう「第2の記録モード」における印刷である。また、上から13番目以降のラスタのような、2以上のノズルが通過するラスタについては、最後にラスタを通過するノズル、およびその直前にラスタを通過するノズルのみがドットを記録するものとする。

【0090】第3実施例では、印刷に使用する画像データDは、印刷可能領域の上端である、副走査方向上流の端から7番目のラスタから設定する。しかし、第1実施例と同様の理由から、印刷は、印刷用紙Pの上端が副走査方向上流の端から37番目のラスタの位置にあるときから開始する。その位置を図23において印刷用紙Pの上端の想定位置として示す。すなわち、第3実施例においては、想定される印刷用紙Pの上端の位置を越えて36ラスタ分だけ画像データDが駆けられる。このため、印刷用紙Pの送りに調整が生じて印刷用紙Pが余分に送

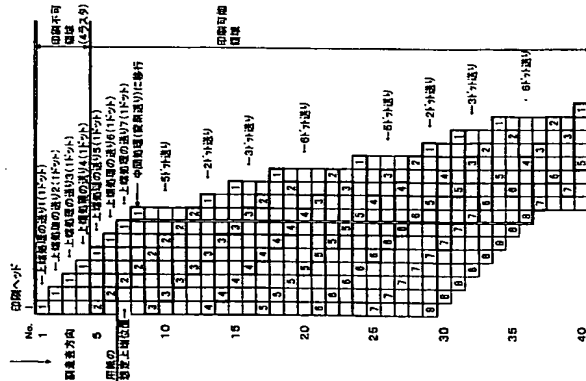
なわち、印刷用紙が存在しない範囲に）設定されたラスタに対してインク滴を吐出しても、プラテン26a上にインク滴を蓄積させてしまうことがない。また、印刷用紙Pの送りに調整が生じて印刷用紙Pが余分に送られてしまった状態で、印刷用紙Pの下端部に割り当てられたラスタに対してインク滴を吐出しても、送りの調整が40ラスタ分以内であれば、プラテン26a上にインク滴を蓄積させてしまうことがない。

【0083】なお、印刷用紙Pの下端部を記録するときには、印刷用紙Pの上端部を記録したときと比べて、印刷用紙Pが短い距離を送られている。したがって、印刷用紙Pの下端部を記録する際には、印刷用紙Pの上端部を記録したときに比べて、印刷用紙Pの位置の調整が大きくなっている可能性が高い。また、下流側紙送りローラ25dは、送車状のローラであり、下流側紙送りローラ25c、25dの組み合わせは上流側紙送りローラ25a、25bに比べて送り精度が低い。よって、この点からも上端部を記録する際の印刷用紙Pの位置の調整よりも、下端部を記録する際の調整の方が大きい可能性が高い。よって、第2実施例のように、印刷用紙Pの下端部において上流側端部26f a上のノズル（#9～#11）のみによって記録されるラスタの数、印刷用紙Pの上端部において下流側端部26r a上のノズル（#1～#3）のみによって記録されるラスタの数よりも多く設定することが好ましい。そして、画像データDにおいて、印刷用紙Pの下端をこえて設定するラスタの数、印刷用紙Pの上端をこえて設定するラスタの数よりも多く設定することが好ましい。

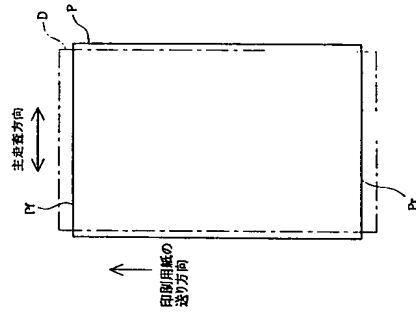
【0084】D. 第3実施例：図21は、第3実施例における印刷ヘッド28bと上流側端部26f bおよび下流側端部26r bの関係を示す側面図である。ここで、1列のノズルが48個のノズルを有する印刷装置において上端処理および下端処理を行う場合について説明する。ここで使用する印刷装置では、下流側端部26r bは、副走査方向について、ノズル#1～#12と向かい合う位置に設けられる。また、上流側端部26f bは、ノズル#37～#48と向かい合う位置に設けられる。他の点はすでに説明した印刷装置と同様の構成である。

【0085】図22は、第3実施例におけるインクが吐出するヘッド61b～66bにおけるインクジェットノズルN zの配列を示す説明図である。この第3実施例では、各ノズルのピッチとラスタのピッチとは同一である。したがって、印刷ヘッド28bは、一度の副走査で隣り合うラスタにドットを記録することができる。図22においては、プラテン26bの上の流側端部26f bと向かい合う範囲をR fで示している。範囲R fに存在するノズルはノズル#1～#12であり、範囲R fに存在するノズルは#37～#48である。第3実施例では、この印

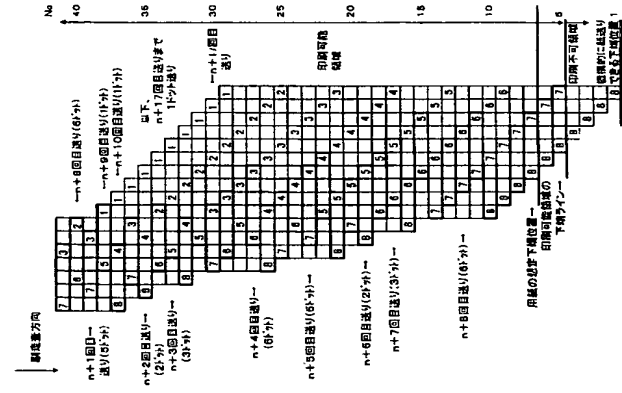
【図8】



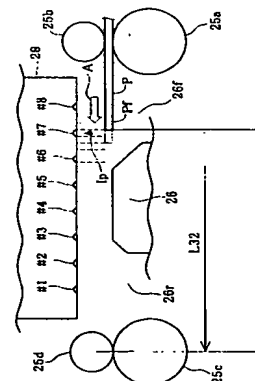
【図9】



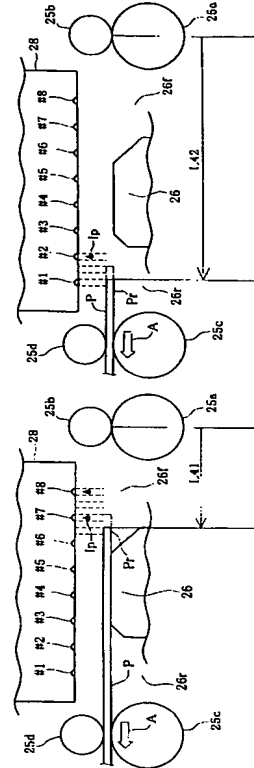
【図12】



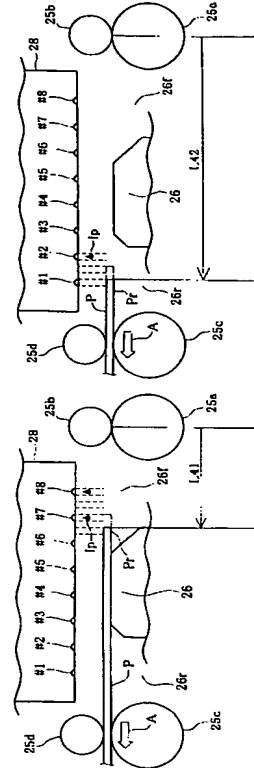
【図11】



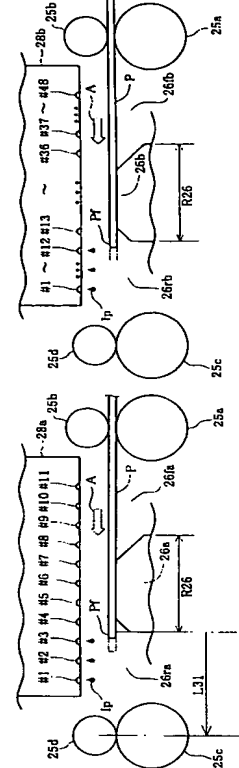
【図14】



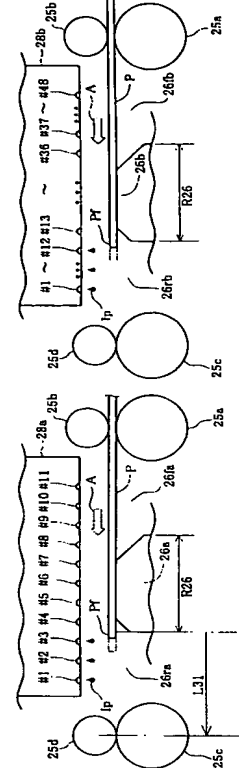
【図15】



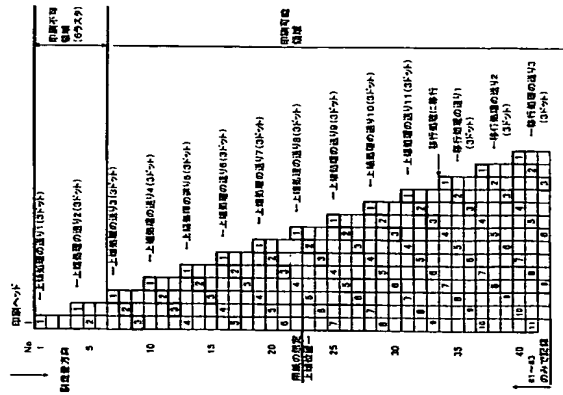
【図16】



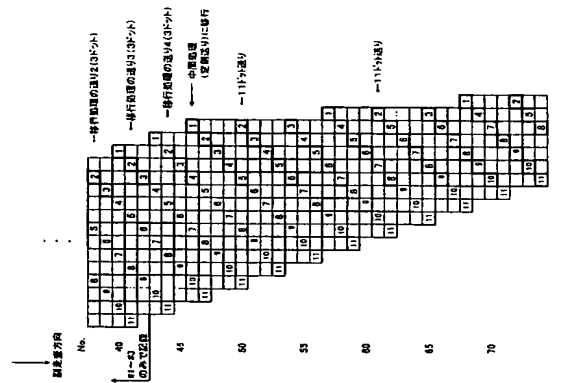
【図21】



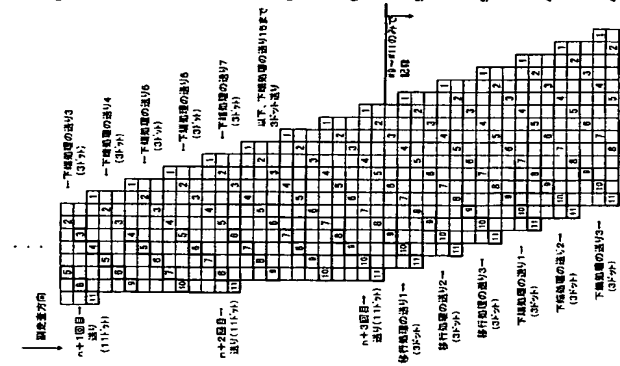
【图 17】



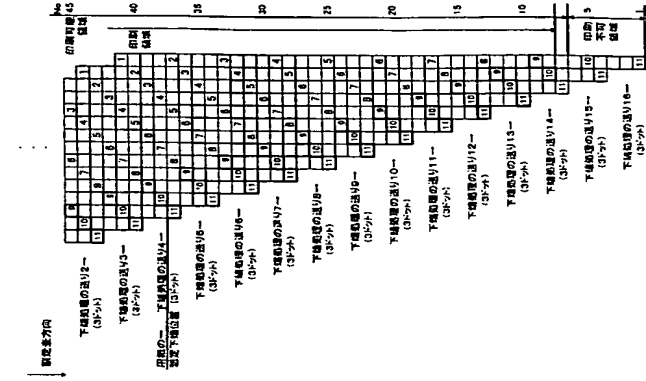
【例 18】



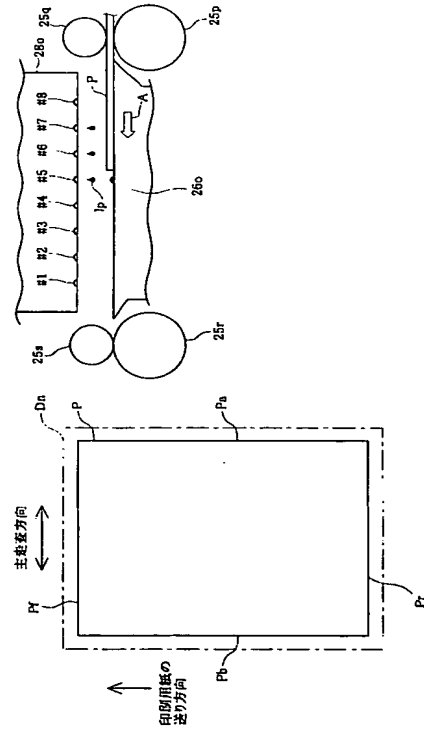
【619】



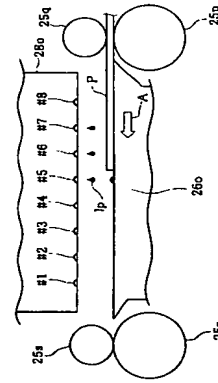
【图20】



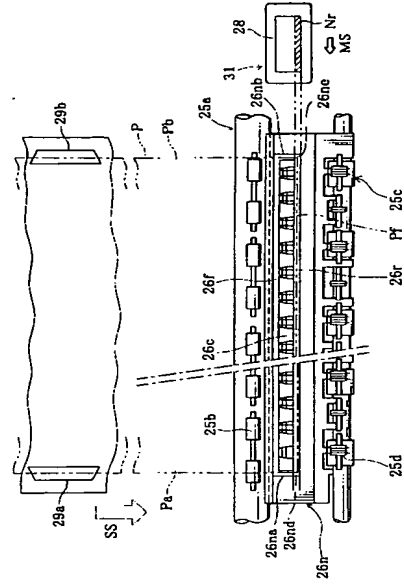
【27】



【30】



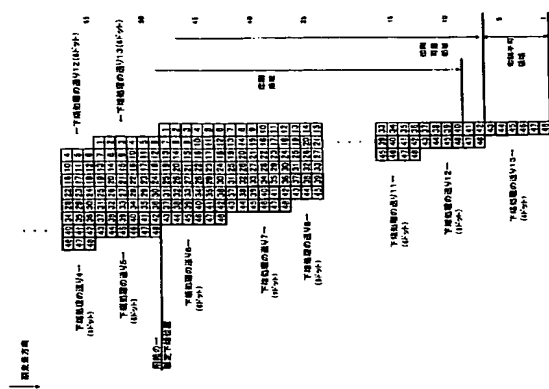
【图28】



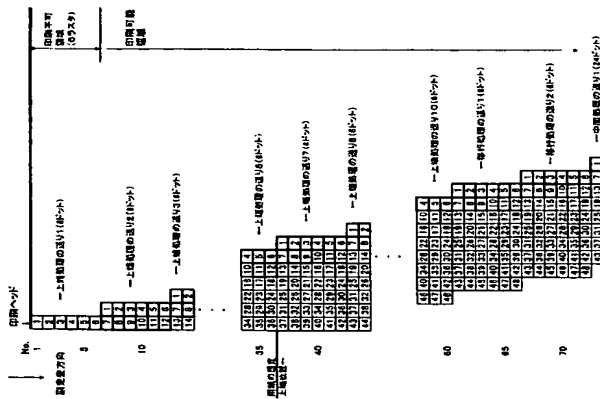
【25】



【图26】



【23】



【29】

